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Safety Inspectors and Inspections

The Different Types of Inspection—Why Some Plants Are Refused Insurance—Importance of Standardizing Safeguards—Advantages of Helping Inspectors

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TO SOME managers, superintendents and foremen the visit of a safety inspector to a plant is regarded as a nuisance, or something worse. On the contrary, many plant officials welcome such inspections and are glad to carry out the recommendations which are made. If your plant is one which carries insurance in an old line or a mutual company and is located in a state which maintains a force of factory inspectors, it is probable that you will receive visits from inspectors belonging to three different organizations.

First: The inspector who makes a rating inspection. His card will read "Rating Board," or "Rating Bureau." His function is to make an inspection of your plant, noting the mechanical and structural hazards, take notes regarding the number of employees engaged on machine work, total number of employees, safety organization work and a number of other points which enter into the final adjustment of the basic or manual rate which is charged to your particular line of work. If the rating inspector finds conditions, generally speaking, better than the average your rate for compensation insurance will be below that given in the manual for your particular class of work; if your plant is sub-standard your rate will be higher. The function of the rating inspector, then, is to collect data from which the rate for your establishment may be computed.

Neither he nor the organization employing him makes any recommendations regarding conditions in your plant. His duties end when he turns in the data at his district board or bureau. The rate finally worked out for your plant is available to insurance organizations upon application.

It may be that subsequently another rating inspection will be requested by your insurance carrier to secure a reduction in rate on your plant, after you have installed guards or otherwise improved working conditions.

The insurance carrier will in all probability make an inspection of your plant shortly after the business is actually written. (In a few instances even before the policy is issued.) The purpose of this inspection is threefold: (1) To check the rate already set by the rating board or bureau; (2) to assist you in reducing your rate by recommending guards and improving conditions generally; (3) to make certain that there are no special or unusual hazards incident to the operation of your plant that would make your risk undesirable from an insurance standpoint.

The card presented by this inspector will carry the name of the company with whom you are insured and his visit will (unless yours is that long sought Utopia—a Perfect Plant), be followed by a set of recommendations covering various hazards on your plant. Generally, the inspector himself will take up these points with someone in authority before he leaves.

The insurance carrier reserves the right to cancel your insurance on a pro rata basis should you refuse to carry out recommendations which they believe necessary. A few companies mark such recommendations "Vital" or "Important," the others being submitted largely to enable you to effect a subsequent reduction in rate.

What Cancellation Means

Should your insurance carrier cancel or suspend your policy pending the carrying out of certain recommendations, you may rest assured that there are hazards considerably greater than are usually found in plants doing the same kind of work as is performed in your plant. The agent and the underwriting department generally are "from Missouri" and will agree to cancellation or suspension only after the unusual hazards have been clearly proved by the inspection department.

Probably in your own business your credit department has often refused to O.K. a bill of goods sold by one of your salesmen because the financial standing of the purchaser was unsatisfactory. The case of a cancelled or suspended risk is similar, it is an indication that the risk from a physical or moral hazard point of view is undesirable business. As an example, a case which came under my own observation might be cited. A small concern manufacturing case-hardening compounds was written by a local agent. On inspection it developed that the assured was melting up about 300 lb. of potassium cyanide (one of the most poisonous substances known) per day in a melting pot located in a basement, no artificial ventilation being provided. Inquiry developed the fact that during the previous summer several men had been overcome by fumes. This concern also ground charcoal in a small mill—giving rise to a serious dust explosion hazard—and stored a large amount of the material, generally several tons, in the main building which was of ordinary frame construction—which added the fire hazard from the spontaneous ignition of this material. In addition, the company bought and ground up old bones, the material being hand sorted, thus introducing the possibility of serious infection from minor cuts and abrasions as well as the possibility (admittedly slight) of anthrax.

These hazards were all in addition to the usual

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mechanical hazards and were in the aggregate so serious that the company canceled the business and refused to rewrite it unless the assured agreed to install a suction exhaust over the cyanide vat, store and grind the charcoal in a separate fireproof building and provide heavy gloves for the bone sorters. As the assured refused to carry out the suggestions, the company refused to rewrite the risk.

The State Inspector

It is probable that you will receive a visit from a third inspector during the course of the year. His card will carry the name of the state department, board or bureau that is concerned with factory conditions. His recommendations generally have the law behind them. Either the code under which the inspection is made is a part of the statute law of the state or the authority is given to some board or bureau to write such codes as may be necessary.

One of the most annoying features of these various safety inspections is the lack of uniformity in the resulting recommendations.

Often a set of recommendations has been carried out by a manufacturer only to have a long list of additional recommendations submitted subsequently by another inspector. This is one of the unfortunate results of the present lack of uniform safety codes—a subject that has been discussed at greater length in another paper*. There is one consolation in the present outlook. A series of safety codes are now in course of preparation, the work being handled under the auspices of the American Engineering Standards Committee and within a few years it is probable that state and insurance requirements will coincide and the various state laws will be in practical agreement on all principal points covered.

Effect of the Personal Element

Another cause of variation in recommendations is the personal element; the training, experience and viewpoint of the inspector unconsciously influence him in making recommendations. Other things being equal, the longer the training and the greater his experience the better will be his inspection.

There is a certain type of factory executive who takes great delight in tripping up an inspector, in exposing his ignorance and criticizing his report in every possible way. I remember a particular case that came to my attention while I was making an insurance inspection in a large furniture factory. The superintendent showed me a report submitted by a state factory inspector.

One of the items called for the guarding of the drive belts of a surfacer, the room and building in which it was located being specified. The superintendent then pointed out quite triumphantly that the room mentioned was devoted to finishing and that the only machine that could be so mistaken was a sander. Later, in the course of my inspection, I saw the machine in question. It was an auto-fed, completely enclosed, multiple-drum sander, and resembled many of the newer types of surfacer. The mistake was a natural one, as I pointed out to the superintendent. Then it was that I found the reason for his antagonism; he informed me that the inspector in question had recently been appointed through political influence, and that prior to his appointment he had been a butcher.

Unfortunately such appointments are made in a few states although the tendency is to eliminate political influence and to make appointments on merit as a result of competitive examinations. Where such abuses do exist, however, the solution lies, not in abusing the inspector so appointed, but in demanding through manufacturers' or civic organizations that inspectors be appointed on merit only, and as a result of competitive examinations.

In the insurance field the men are generally the best obtainable for the salary allowed, this item, of course, being limited by the percentage of premium income set aside for inspection purposes.

Working With Inspectors

If more factory executives would realize the value of trained men in the inspection field, there would be better inspection service. If, in place of damning an inspector for his ignorance, the superintendent would go through the plant with the inspector, explain the work and name the machines, it would mean that the inspector would become familiar with the processes involved in a much shorter time and his recommendations would be correspondingly more valuable.

The inspector is governed largely by certain fixed rules and standards developed after a careful study of the statistics covering thousands of accidents, and which are reasonable and applicable in *most cases*. However, like all other rules there are exceptions. It may be that there are special conditions in your plant that cannot be taken care of in the usual manner. I have one such case vividly before me now. A state factory inspector insisted on a guard rail along a log carriage runway in a large sawmill, and specified a rail of standard height—42 in. A saw carriage is a rapidly-moving object, as anyone who has seen a sawmill in operation will admit, but in this case the standard handrail was not only undesirable but even dangerous. The superintendent of this particular mill was one of the type who saw the advantage of educating the inspector. He took the man into the mill and explained how a standard rail would prevent the escape of the three men that worked on the carriage should the log tear loose while being sawed or should the "steam nigger" (which places the log on the carriage and turns it over as needed) throw a log over the "knees" on to the setter's stand, or should the shackle connecting the carriage with its driving rod break, or should anyone of a dozen similar accidents happen. He did admit that the carriage-run should be guarded but said that a rail higher than the setter's platform was not only impractical but dangerous. The inspector agreed with him, and what is much more to the point *knew how to guard the carriage-run in the next sawmill he visited.*

Dozens of such examples might be cited. Explosive plants must have guards of special types and materials. The question of possible sparks from static electricity in plants where solvents are used must be given due consideration. Practically every industry has its own particular phases which must be known and given due consideration by the safety inspector.

It must be borne in mind that the state insurance or rating inspector must know the machines not only in your industry but in that of hundreds of different industries as well. He may be in a Portland cement mill to-day, an automobile factory tomorrow and then be sent in succession to a factory making clothespins, pickles, gas mantles, toothpicks, glass bottles or brooms. The

*See "Standardization and Safety," by C. E. Oakes and the author in *American Machinist*, July 1, 1920.

wonder of it is that any man can ever learn the machines and processes that he meets in his daily work.

While, as we have pointed out, there may be conditions in your particular plant that will make necessary special types of guards, conditions of which the inspector may know little, the converse of the proposition also holds true. There may be, and probably are, hazards in your plant of which you know little or nothing, but which will be apparent to the trained inspector. Do not make the mistake of thinking that *because you have never had an accident under a given set of conditions that such an accident cannot occur.* A number of years ago a rather popular play pictured a college sophomore showing his father the town. One act showed them in a famous restaurant where the father when called down by the son for eating with his knife informed the crowd that he had "been eatin' with his knife for fifty years and never cut hisself yet." That attitude unfortunately is the one taken by some of the old-time manufacturers. They believe that having never had an accident on a given machine that they never will have.

In a certain plant where solvents were used in the manufacture of a synthetic compound, I once recommended a number of additional exits and flash-proof walls between mixers. The man in charge claimed that the process was absolutely safe, that he had been in charge of that plant for twenty years and that he knew more about the hazards of the business than any d— inspector in the business. Within six months a fire in that particular room took a toll of three lives and sent twenty men to the hospital, the total compensations amounting to twelve thousand dollars or eight times the amount needed to have carried out the recommendations on that particular building.

Requirements Drawn From Careful Analysis

There are two time-worn "saws" which, coupled together, are well worth remembering in connection with the reading of an inspector's recommendations.

"Experience is the best teacher," and "The wise man learns by the experience of others."

Remember that the requirements for state and insurance codes were drawn from a careful analysis of thousands (in some cases hundreds of thousands) of industrial accidents.

No plant of average size can judge its own hazards solely by its own records. It is only when thousands of cases are considered that the Law of Averages, which is the bedrock upon which insurance rates are based, can be depended upon to function properly.

A person loses perspective by daily contact with a thing. There is not one man in a hundred that can tell the number of steps leading up to his own front door, or the color of the rug in the living room, or describe in detail the pictures hanging in his own dining room. If you wish to look at a public building you do not stand on the front steps. You get far enough away to see the whole thing as a unit. Often as you watch a game of chess or checkers you will see moves which might win the game, yet the player himself is entirely oblivious of them.

The same thing is true in a factory. The inspector will often see hazards that are not apparent to anyone in daily contact with them.

In conclusion, let me make the following plea for the safety inspector: Remember that he is a human being, that he is honestly trying to make your plant a better and safer place to work in; that the more you co-operate with him the better will be his inspection; that his recommendations are based on thousands of accidents occurring under similar conditions, and that coming in from the outside he may be able to call your attention to conditions which you from your nearness to them have never recognized.

Automobiles in Japan

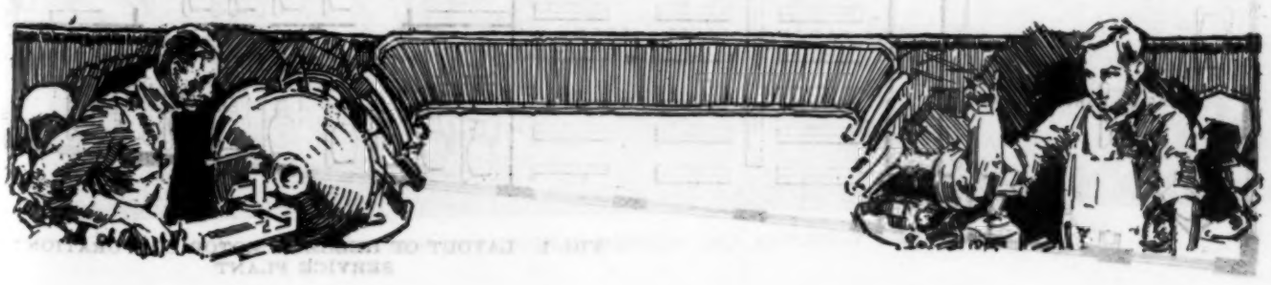
Commercial Attaché James F. Abbott

The Japanese have manufactured motor cars, and for a time they hoped to become independent from foreign manufacturers. It was soon discovered, however, that the cost of fabricating a complete car exceeded the cost of importing an American car, owing to the lack of facilities for working on a large scale, the relative inefficiency of the Japanese workmen, and the necessity for importing practically all the materials. The Department of War has been anxious to have an adequate number of cars or chassis which might be converted to military purposes. On this account they put through a subsidy bill, designed to induce the Japanese to import and own cars.

The Tokyo Bus Service has been developed and expanded; it is, however, hard to see how the proposition could be made successful except with some sort of official support. It is also understood that official support has been given the Tokyo Gas and Electric Co. to enable it to import truck chassis and manufactured buses.

While Japanese-made machines practically do not exist, it is customary to import chassis and to fabricate closed bodies for them in Japan; several companies, especially in Tokyo, do a good business in this line. This is accounted for by the climate, which makes closed cars almost a necessity, and by the burden of freight charges, which makes the cost of importing bodies such that the Japanese can usually compete successfully in this line.

The use of motor cars in Japan is generally limited to the large cities, owing to very poor roads, and the use of heavy trucks is hampered further by the frail nature of bridges. While most of the motor cars in Japan are found in the city of Tokyo, the market there has suffered severely within the present year from a local license tax assessed by the municipal administration, rendering the cost of the automobile in many cases prohibitive.



Automotive Service Methods and Equipment

IV. A Good Service Plant Layout—Progressive Operations in the Service Department—A Handy Motor Stand—Re-babbitting Fixtures—Other Tools

BY HOWARD CAMPBELL
Western Editor, *American Machinist*

FOR efficiency in the matter of plant layout, the service plant of the Hellman Motor Corporation, Long Island City, N. Y., is an interesting study. An outline of the building is shown in Fig. 1. The salesroom is in the usual location, and the parts department is accessible both from the street and from the shop. The car owner in search of service drives into the service adjustment department, where the car is inspected. If the trouble is very serious an inspector's tag, on which are enumerated the troubles, is hung on the car and it is passed through the doorway indicated by the arrow into the repair department. If the motor is to be overhauled, it is lifted from the chassis by means of an overhead hoist and passed along an over-

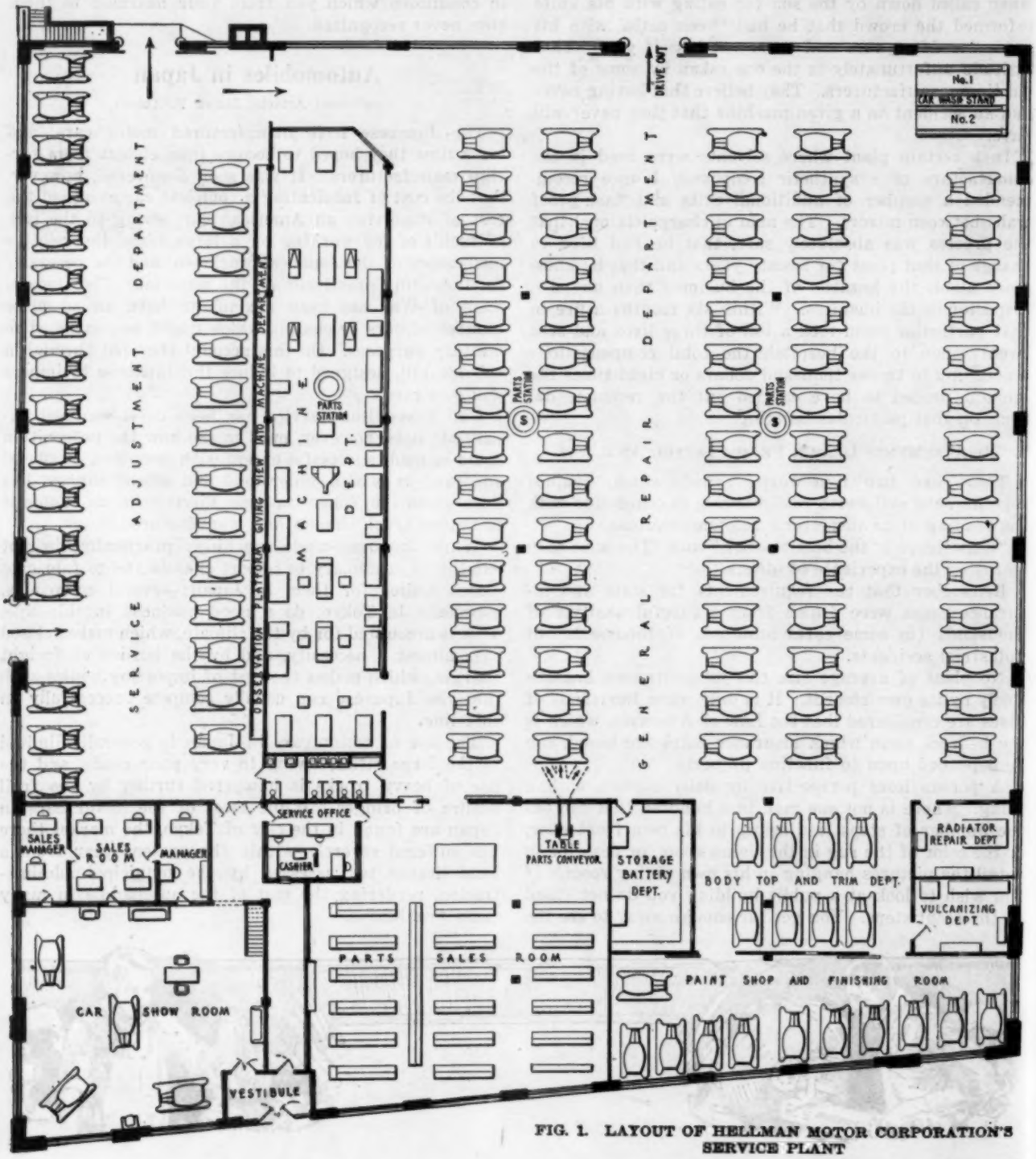


FIG. 1. LAYOUT OF HELLMAN MOTOR CORPORATION'S SERVICE PLANT

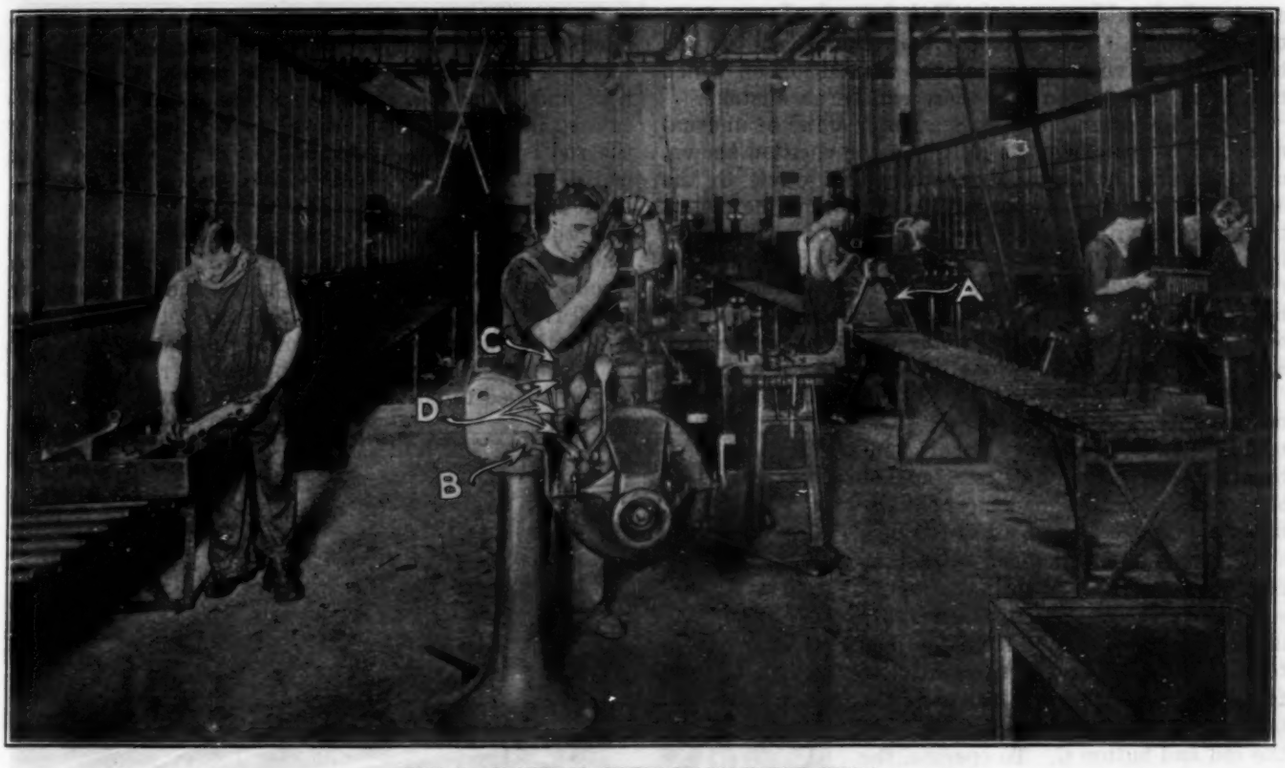


FIG. 2. GENERAL VIEW OF MACHINE SHOP

head track into the machine shop, through the doorway *A*. Just inside the doorway are two disassembling stands where the motor is disassembled. All the parts are then washed in a wash tank, after which they are inspected. The inspector puts scrap tags on the bad parts and makes out an order for replacements, sending both parts and order to the stockroom, which is adjacent to the machine shop. New parts are returned immediately and these, together with the parts that have been saved, are put on to what is called a "gunboat"—a rack in which are hooks and holes for all the parts that go into a Ford motor. One of these gunboats can be seen at *A* in Fig. 2. This rack then is started on its way through the machine shop via a roller conveyor. As it is passed to each operator in turn, that operator performs certain operations for which he has the tools and equipment, sometimes several operators performing their operations on a motor simultaneously. The result is that a motor can be overhauled completely in a very short space of time. At the left of the picture, Fig. 2,

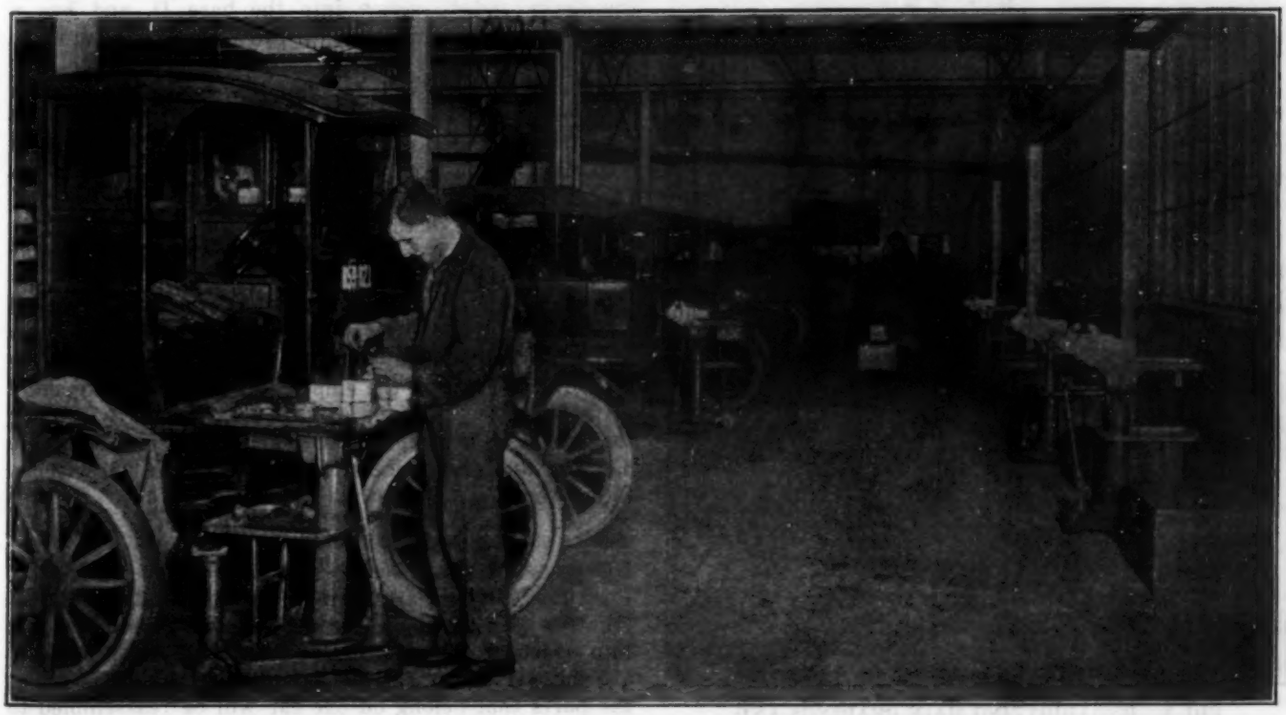


FIG. 6. VIEW OF GENERAL REPAIR AND ASSEMBLY DEPARTMENT

can be seen the conveyor by which parts are sent from the stockroom. All parts for one motor come in one box, together with a copy of the requisition on which they were ordered, so that there can be no mistake.

In the foreground, Fig. 2, is a motor stand of unusual merit. The motor can be locked in the position shown, or in several positions around the half circle to the opposite position. To change the position of the motor, the pin *B* is withdrawn, the section to which the motor is bolted swung to the position desired, and the bolt replaced. Provision is made for turning the motor to a horizontal position, this being accomplished by pulling out the pin *C*, turning the motor to the angle desired, and replacing the pin in one of the slots shown at *D*.

The operator shown in Fig. 3 is babbitting the main bearings of a Ford crankcase. The tool in use is a Hempy-Cooper combination ladle. The ladle is composed of part *A*, which is made to hold the babbitt and a section of a Ford crankshaft, the end of which can be seen at *B*. The ladle is made so that when it sets down on the bearing, the shaft is just the right height from the bottom of the bearing aperture to allow for a good bearing. A valve in the bottom of the ladle is controlled by the rod and button *C*. To operate, the ladle is set over the bearing, a sufficient amount of hot babbitt is poured into the ladle and the valve is opened, allowing the hot babbitt to run into the aperture and around the lower half of the shaft, forming the bearing. The ladle will hold enough hot metal for all three bearings, all of which can be poured in a very few minutes.

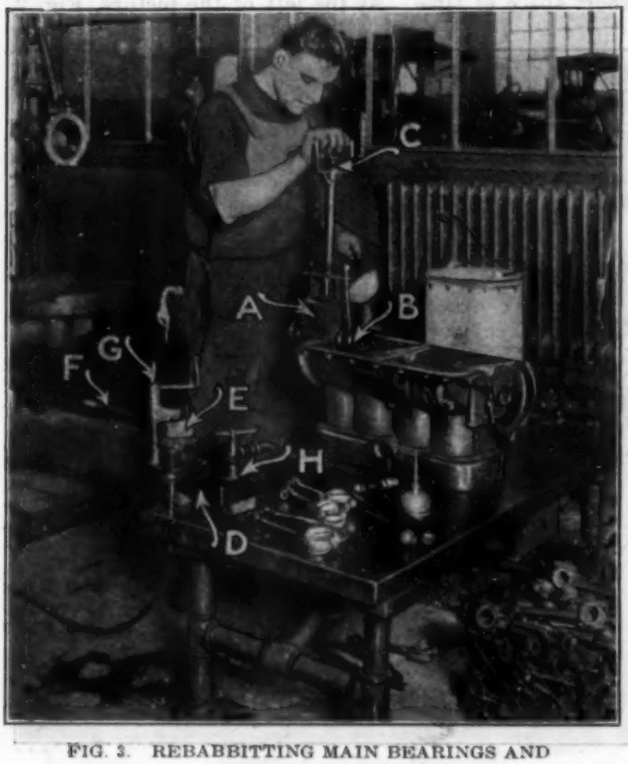


FIG. 3. REBABBITTING MAIN BEARINGS AND CONNECTING RODS

On the end of the table in Fig. 3 is a fixture for rebabbitting connecting rods. The principal part of this tool is a hollow cast-iron box *D*, to which is attached a hose and a small waste pipe so that water can be circulated in the fixture to keep it cool. The small end of the rod is slipped down over a pin at *H*, and the large end is clamped in to a seat which shapes the metal on the lower side of the rod. The piece *E*, which is clamped over the upper side of the rod, resembles a small iron wheel with a very wide rim and a projecting hub, with a solid web from the hub to the rim. The rim keeps the metal from flowing away, and the hub is the point upon which the clamp rests, as shown. A hole in the web allows the metal to flow through into the rod. A handle *F* is attached to part *E* so that it can be handled while hot. The pin *G*, which holds the clamp, is threaded at the lower end to screw into the base *D*, and has a shoulder which sets down on the clamp to hold it in position.

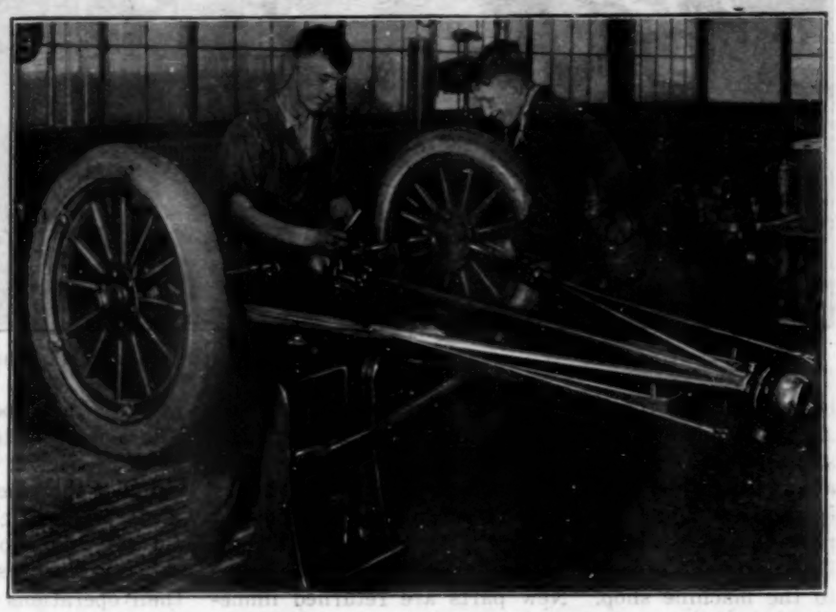


FIG. 5. AN AXLE STAND

A burning-in stand for finising main bearings to size is shown in Fig. 4. The crankshaft is tightened down in the bearings, and the flange end of the shaft is connected to the coupling at *A*. Then the machine is run at a speed which in a few minutes will practically melt the surface of the bearings so that as they solidify while the machine is running, a fine smooth bearing is obtained.

A stand for holding an axle while it is being worked on is shown in Fig. 5. The axle is held in two vises which are adjusted by means of handwheels as can be seen by referring to the empty stand in the background of the picture. A stand of this construction will allow the axle to be held in the position most desirable for the operator and gives access to all parts of the job without interference.

The Assembly Room

A view of the assembly room is shown in Fig. 6. Positions for cars are marked out on the floor, and in front of each car, against the wall, is a substantial box into which all the small parts that are taken off the car are put. The box can be locked, if necessary, so that the parts that belong on one car will be reassembled to the car from which they were taken. A portable vise is

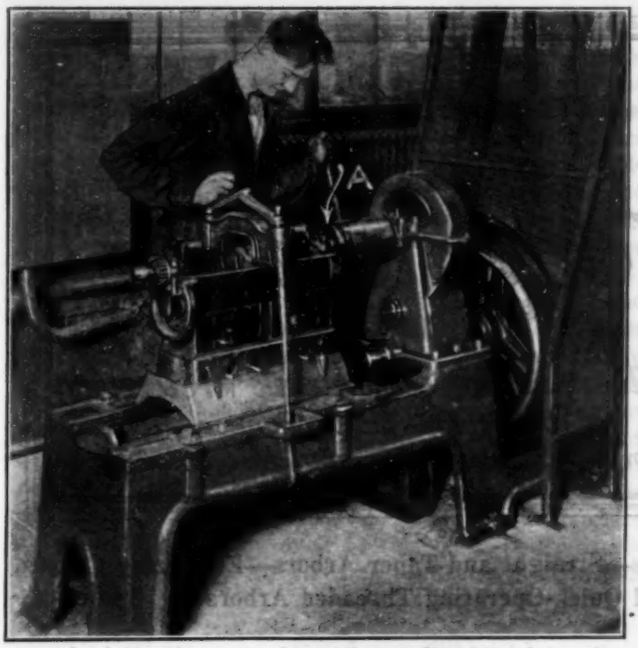


FIG. 4. BURNING-IN MAIN BEARINGS

supplied for each job, so that the workman need lose no time walking back and forth from the car to the bench. Each vise is equipped with two trays, and under the top tray is a small drawer which can be locked.

The room is built to accommodate seventy-four cars, arranged in five rows, with plenty of working space around each car. Cars that have to have the motor overhauled or other heavy repairing done go into the first row, the second is reserved for axle repairs, the third is for valve grinding and other minor repairs, the fourth for radiator and electrical repairs, and the fifth row is for trucks and tractors. An overhead mono-rail extends the full length of each row, the total length of the mono-rail system approximating ¼ mile. A gravity conveyor is provided from the stockroom, arranged so that boxes of parts can be sent to either one of the two parts stations. A mechanical conveyor in the stockroom, operated by an elecric motor, is used to lift the consignments of parts to a point high enough so that they will travel into the shop by gravity.

A Labor-Saving Wash Rack

A wash rack that will be interesting to garage owners and executives is shown in Fig. 7. As can be seen, ways are provided upon which the car is run so that it is off the floor. A series of vertical sprays is arranged under the car, thus doing away with a great deal of labor and lost time. A hose from the air-line is connected to the spray, the air adding considerable pressure to the spray and helping to remove the dirt.

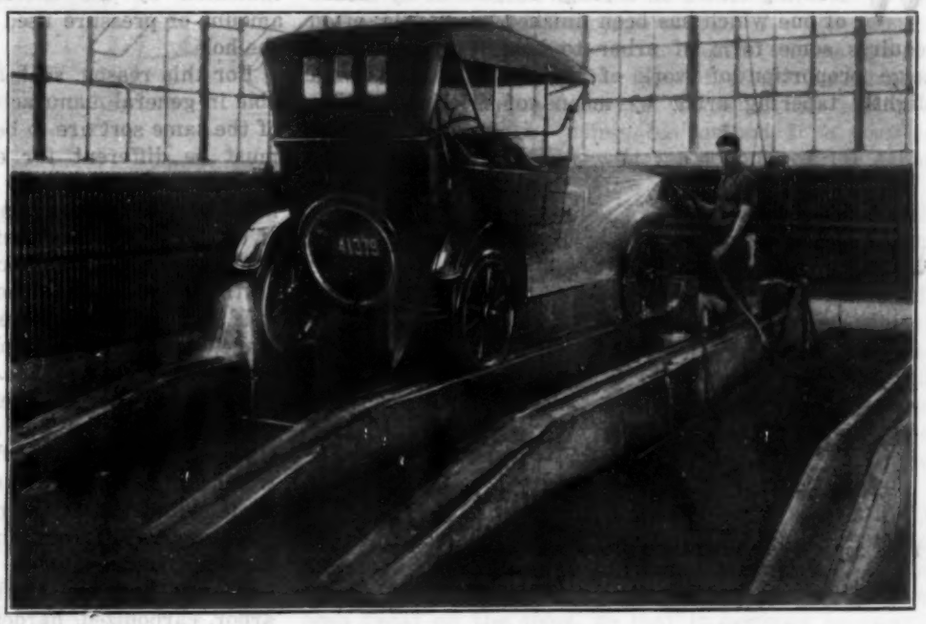


FIG. 7. CAR WASH RACK

Industrial Statesmen Needed

By James J. McCabe

Nothing like an entente cordiale prevails between labor and management. Management has not forgotten that organized labor during the war days exacted all that the traffic would bear. Management is resentful.

Heedless of the necessity for accelerating liquidation so as to hasten the return of normal conditions, labor is giving indubitable evidence of its intention to hold most of the advantages obtained during the stress of war. When necessity compels, the unionists retreat; but the line of retreat probably is studded with grudges. Indeed it may be surmised that in those cases where labor has been forced to give ground, the first propitious opportunity to recover that which has been lost, will be capitalized.

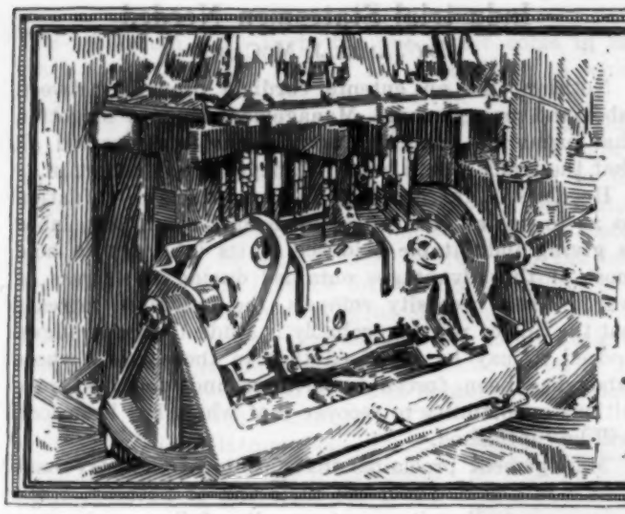
Management proclaims that profits of industry have been whittled down to the little end of nothing, while labor asserts that it cannot permit a full squeezing out of war inflation, inasmuch as the cost of living has not descended to the extent of more than a few farthings.

Without holding a brief for either interest, an onlooker from the side lines may be permitted to venture the statement that the country needs industrial statesmen rather than industrial warriors. Bandying words serve only to beget intolerance. Ruthless warfare by either side will not hasten economic repair.

At this time when wages must follow the general trends of the market places, and when organized labor is losing its potency, management has a golden opportunity to show labor that it is intent upon exemplifying the square deal. Now is the time for both employer and employed to abide by the counsels of fairness and to establish mediums for the free interchange of views with the object of fostering co-operation.

With co-operative organizations in every plant, with representatives of the employers and employed sitting together at council tables freely discussing conditions, intolerance would in due time give way to forbearance and understanding.

The task is one that calls for constructive industrial forces; not destructive, industrial warriors.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Inside Holding for Second-Operation Work on Lathes—Straight and Taper Arbors—Equalizing Collars, Washers and Driving Dogs—Plain and Quick-Operating Threaded Arbors

WORK which is to be held from the inside, locating either on a rough surface or by means of one which has been finished previously, often requires some form of arbor to hold it properly. A large proportion of work of this kind is held on a slightly tapering arbor by means of friction. Other pieces are of such a nature that some kind of a driver can be used either in a hole or slot or against some irregular portion of the work. Provision for driving is an important factor in the design of arbors, whether they are of the plain or expanding types. There are a number of types of arbors used in general manufacturing; a few of them are of the standard form, yet many classes of work require special forms according to the shape of the work or the general requirements of holding.

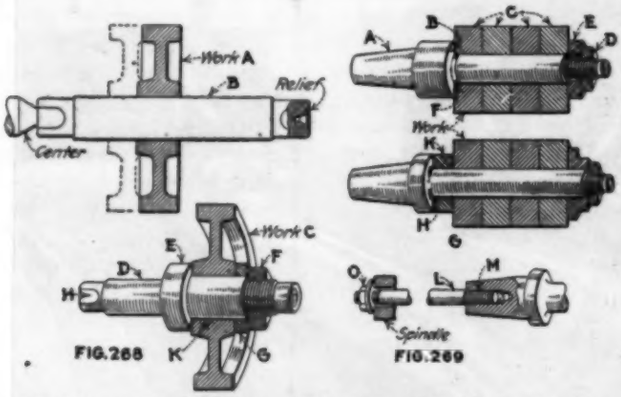


FIG. 268. TWO SIMPLE FORMS OF ARBORS. FIG. 269. PLAIN ARBORS WITH TAPERED ENDS

In Fig. 268 are shown two of the simplest forms of arbors. The work *A* is shown in position on a standard type of arbor *B*, designed to be held between centers on an engine lathe. The work is held in place entirely by friction. The common method of assembling the arbor and the work is to place the latter on an arbor press, and force the arbor into it under pressure. A taper of approximately 0.006 in. per foot is usually given to arbors of this sort. It will, therefore, be seen that the work might take the position shown or it might be as indicated by the dotted lines, depending upon the amount of pressure used when assembling the arbor in the hole.

For this reason, such arbors are somewhat objectionable in general manufacturing when a number of pieces of the same sort are to be made, because the tool setting must be different for each piece on account of the various positions it may take on the arbor. For many kinds of tool work or single-part manufacturing, arbors of this kind are very useful. As only one piece is being made at a time no difficulty is caused by the position of the work on the arbor.

If a number of pieces of the same sort are to be made, as in the example *C*, a plain arbor like that shown at *D* can be made up with a collar or shoulder at *E*. Against this shoulder the work can be firmly drawn up by means of a nut *F* and washer *G* as indicated. One end of the arbor is flatted at *H* to receive the "dog" which is used for driving. Arbors of this kind are made cylindrical at the part *K* which fits the work.

The material from which arbors are made differs in various factories, both machine steel carbonized and hardened, and tool steel being used. A machine-steel arbor, carbonized, hardened and ground, will give good results on a great variety of work. Cast-iron arbors are sometimes used when work is of large size and for special cases when only one or two pieces are to be

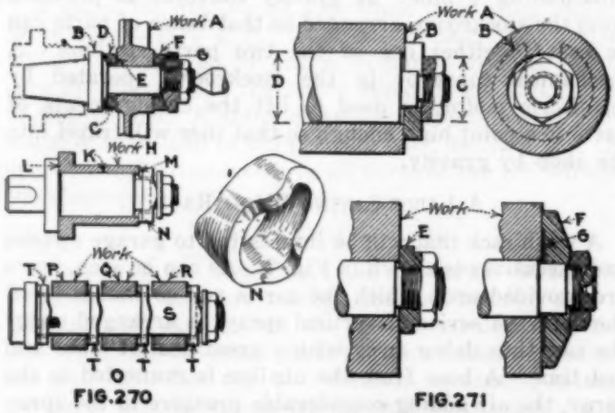


FIG. 270. ARBORS WITH EQUALIZING COLLARS. FIG. 271. USE OF WASHERS

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machined. Satisfactory results can be obtained on this kind of an arbor; but if very heavy cutting is to be done, it is advisable to reinforce the centers in each end of the arbor by means of hardened steel plugs. In designing arbors which are to be used on centers, care must be taken to make the latter as generous as possible and to lap them out carefully after the hardening and before grinding, in order that there may be no firescale or dirt in the centers which might cause them to be ground inaccurately.

A very useful form of arbor, which can be employed in cases where a number of small pieces are to be turned, is shown in Fig. 269. The end *A* is fitted to the taper in the spindle of the machine to which it is to be applied. The arbor is turned up with a shoulder at *B*, against which the work *C* is clamped by means of a nut *D* and washer *E*. In this example the arbor is relieved slightly at *F* to permit grinding up to the shoulder. This relief, however, tends to weaken the arbor, so that it may break at this point under excessive strain. A remedy for this condition is shown in

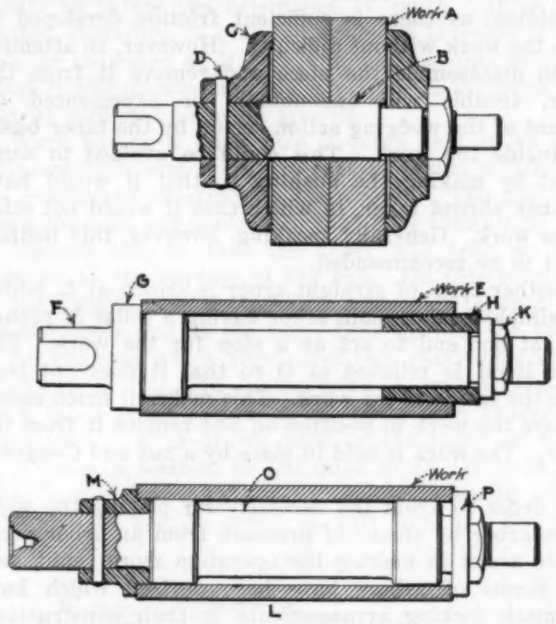


FIG. 272. SEVERAL FORMS OF STRAIGHT ARBORS

the example *G*, in which a fillet is made at *H* in order to give strength. A collar *K* is then used between the shoulder and the work, the collar being chamfered so that it will bear directly against the shoulder on the arbor. This makes a better form than the one previously described, as it is much more rigid and will stand greater abuse. Arbors of the kind shown here can be held in the spindle by means of a draw rod *L*, which is threaded into the end of the tapered portion *M*. The other end of this draw rod is threaded to receive a nut and washer, as shown at *O*. This method allows the arbor to be drawn back firmly into the taper on the machine.

The various points brought up in connection with design should not be passed over by the designer as unimportant, as they are the result of long experience. It frequently happens in the drafting room that a designer, unfamiliar with this class of work, is called upon to design something on this order. The general design resulting is frequently all right, but refinements of the principle, which a more experienced man would incorporate in the design, are left out by the less experienced draftsman.

Work which has been bored and reamed may not have been faced on both sides of the hub, as in the example *A* in Fig. 270. In holding work of this sort on an arbor care must be taken not to clamp it against the rough surface unless suitable provision is made so that no distortion will result. The matter can be easily taken care of by using an arbor like that shown at *B*, having a shoulder *C* in spherical form. Against this shoulder a collar *D* rests, and the other side of the collar bears against the rough portion *E*. This side of the washer should be cut out so that it strikes against three points only. Another washer of similar form is used at *F*, in connection with a special nut having a spherical face *G*. By using this method, it is possible to clamp the work firmly and yet not distort the arbor by bringing unequal pressure to bear on the work.

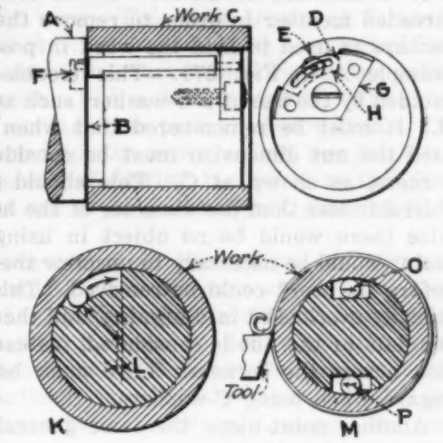


FIG. 273. ARBORS WITH DOGS FOR DRIVING

Another example, showing a piece of work *H* which has been reamed at *K* and faced at *L*, has not been machined on the small end at *M*, this portion being left rough. In holding this piece of work, therefore, it will be necessary to put an equalizing washer *N* against the end of the work, in order that it may not be distorted. A detail of this washer is shown separately, and has some advantages over the other style shown because it does not require a special nut. It is perhaps a trifle more difficult to make up than the other form, but there is not enough difference to be of great importance.

An application of a similar principle is shown at *O* in the same illustration. In this case, there are three pieces of work *P*, *Q* and *R* which are to be held at the same time on an arbor *S*. None of these pieces have been faced on the sides, so that it becomes necessary

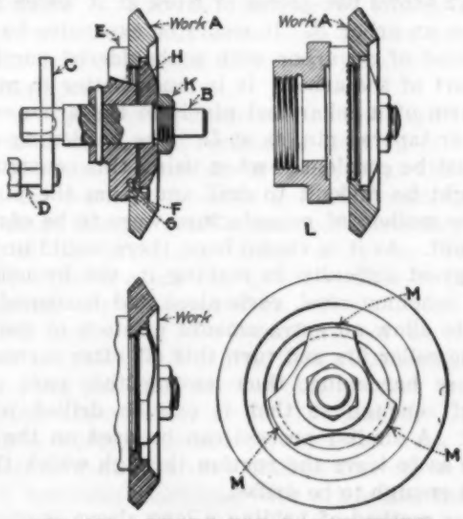


FIG. 274. ARBORS FOR LARGE WORK

to provide a number of equalizing collars, as shown at *T*. The design of this form of arbor will be readily understood from the illustration.

It is tiresome to unscrew a nut completely from a threaded member in order to remove the washer which perhaps is used to hold the work in position, as in the example *A* in Fig. 271. This trouble can be easily avoided by the use of a C-washer, such as that shown at *B*. It must be remembered that when this design is used the nut dimension must be considered across the corners, as shown at *C*. This should always be considerably less than the diameter of the hole *D*, as otherwise there would be no object in using the C-washer and it would be necessary to unscrew the nut completely before the work could be removed. This point is occasionally overlooked in designing, and the distance across the flats of the nut is considered, instead of the dimension across the corners. Care must be taken in this regard when using C-washers.

Another point along the same general line is that it is not good policy to screw up a nut against the face of a piece of work, as shown at *E*, without using a washer between the nut and the work. If this is not done, work will be marred by the sharp corners or edges of the nut while screwing it up. Small washers are to be avoided, unless the work is such as to make their use necessary. It is generally better to make up a form something like that shown at *F*, and relieve the washer at *G* so that it bears only on the outer edges, as shown. This is much better construction than if a small washer were to be used.

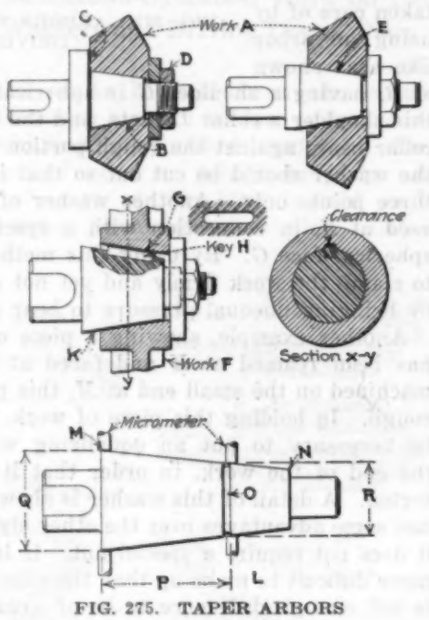


FIG. 275. TAPER ARBORS

Fig. 272 shows two pieces of work at *A* which are to be held on an arbor *B*. It would be expensive to make up this kind of an arbor with a shouldered portion at *C* as a part of the arbor. It is much better to make *C* in the form of a collar and pin it to the arbor with a straight or tapered pin, as at *D*. The hardening of the arbor must be considered when using this construction, as it might be difficult to drill and ream the pin hole unless the method of manufacture were to be carefully thought out. As it is shown here, there would undoubtedly be great difficulty in making it, yet by using an arbor of machine steel, carbonized and hardened, it is possible to allow an extra amount of stock at the point where the collar fits and turn this off after carbonizing and before hardening, thus leaving this part of the arbor soft enough so that it can be drilled without difficulty. A similar process can be used on the collar itself, so as to leave the portion through which the pin goes soft enough to be drilled.

Another method of holding a long sleeve is shown at *E*. This may be considered as a good example of what not to do. The arbor *F* itself has a shoulder at *G* against which work is clamped as indicated. The other end of the work is located by means of a bushing *H* having a slight taper on the outside. This bushing is forced into the end of the work by means of the nut and washer at *K*. There is no doubt about this method of holding, as there is sufficient friction developed to drive the work without difficulty. However, in attempting to disassemble the piece and remove it from the arbor, trouble will undoubtedly be experienced on account of the wedging action set up by the taper bushing inside the work. This could be avoided to some extent by making the bushing so that it would have a rather abrupt taper, in which case it would not stick in the work. Generally speaking, however, this method is not to be recommended.

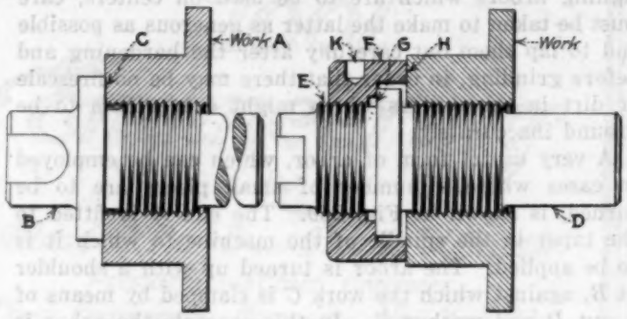


FIG. 276. PLAIN THREADED ARBORS

Another form of straight arbor is shown at *L*, which is a simple type of plain arbor having a collar *M* pinned to it at one end to act as a stop for the work. The arbor itself is relieved at *O* so that it does not bear along the inside of the work. This makes it much easier to place the work in position on and remove it from the arbor. The work is held in place by a nut and C-washer at *P*.

In order to avoid the necessity for placing the work on an arbor by means of pressure from an arbor press and to assist in making the operation more rapid, several forms of arbors have been devised which have automatic locking arrangements in their construction. Several examples are shown in Fig. 273. In one case, the arbor *A* has a shoulder at *B*, against which the work *C* rests. A slot *D* is cut lengthwise on the arbor to receive a roller *E*. This roller is turned down on each end to form pins, one of which enters a slot in the shoulder of the arbor at *F*, while the other enters a slot in a retaining plate *G* fastened to the end of the arbor. The curved portion or bottom of the slot *H* is slightly eccentric to the center of the work, so that when the piece is placed in position and pressure applied in cutting it, the roll becomes further away from the center of the mandrel and grips the inside of the work more and more strongly, according to the pressure applied. The principle is illustrated quite clearly in the detail at *K*. The amount of eccentricity *L* does not need to be great, as too large an amount would prevent the roll from gripping the work firmly and there would not be a wedging action.

Another method which gives quite similar results is shown in an end view at *M*. In this case there are two rolls *O* and *P* opposite to each other in straight slots. The cutting action tends to make them roll to the sides of the slots; and as they do so they become fur-

ther away from the center, thus locking the work securely.

In Fig. 274 are shown several methods of making arbors for large-diameter work. The example *A* can be held in several different ways. The special arbor *B* is provided with a driver at *C*, and is intended to be held on centers in an engine lathe. By using a plug *D* in the faceplate, a "dog" is unnecessary. The arbor is provided with a collar *E*, pinned to it and so arranged that the work locates directly on the shoulder *F* and against the face *G*. It is drawn up in place by a large washer *H* and a nut *K*. This form of arbor can be mounted on an adapter, as shown at *L*, if the nature of the work requires it. The method of locating the work is, however, the same in either case, the only difference being in the application of the arbor to the adapter.

A point of importance in connection with the use of large arbors is the bearing of the washer on the work. If made so that it has a contact all around, any slight inaccuracies on the face against which it is clamped are likely to throw the arbor out of truth. It is much better, therefore, to give the washer a three-point bearing, as indicated at *M*. If it is made a loose fit on the stud, it will equalize any imperfections in the work to an extent sufficient to avoid trouble.

Work having a taper hole is often held on an arbor of some sort, and there are certain points which must be considered carefully in the design. The point has been brought out previously that it is difficult to ream a tapered hole so that the taper will bear an exact relation to the surface of the hub. On this account it is not usually possible to locate a piece of tapered work on the taper and at the same time against the face.

An example which illustrates this point very clearly is shown in Fig. 275 in the work *A*, which is located on a taper arbor *B* and at the same time against the shoulder *C*. It is drawn back on the taper by means of a nut and washer, as indicated at *D*. It looks very nice in the drawing; but in reality it would not be advisable to use an arbor of this kind, as the work

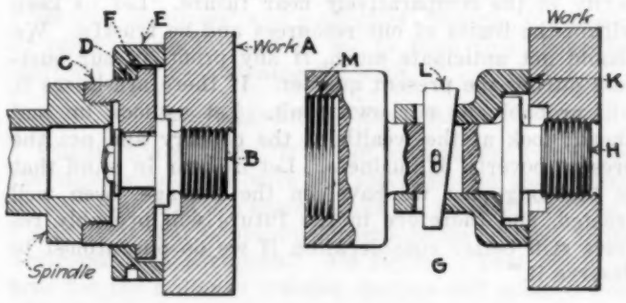


FIG. 277. TWO TYPES OF ARBORS FOR THREADED WORK

might "make" on the taper *B* before it reached the shoulder *C*, or it might strike the shoulder *C* before the taper completely filled the hole. In one case the shoulder would be of no use, and in the other case the work would not be located centrally because it would not fit on the taper. By making up an arbor of this sort like that shown at *E* all trouble is avoided, and the work is located entirely by the taper, as it should be.

If a condition should be found such that it became necessary to locate by the taper and also against the shoulder, as might be the case with a piece of work having a wide flange which needed support, compensation could be made for the variation by using a taper spring bushing similar to one which has been previously shown. The necessity for such an arrangement on small work is comparatively rare. The work shown at *F* has a keyway cut in it at *G*. It is, therefore, a very good idea to take advantage of this fact in making up the arbor, and provide it with a key, as indicated at *H*. The arbor itself *K* is of similar form to that shown at *E*. The advantage of providing an arbor with a key is that it serves as the means of driving the work, so that it is not necessary to use great pressure in tightening it on the arbor.

A point of importance in the making up of taper arbors is indicated in the diagram at *L*. The toolmaker who makes up the arbor is obliged to measure it with micrometers in order to determine the taper. It is easy enough to measure across the corners, as at *M*, but it is practically impossible to measure the diameter at *N*. If an arbor is made up, however, like that

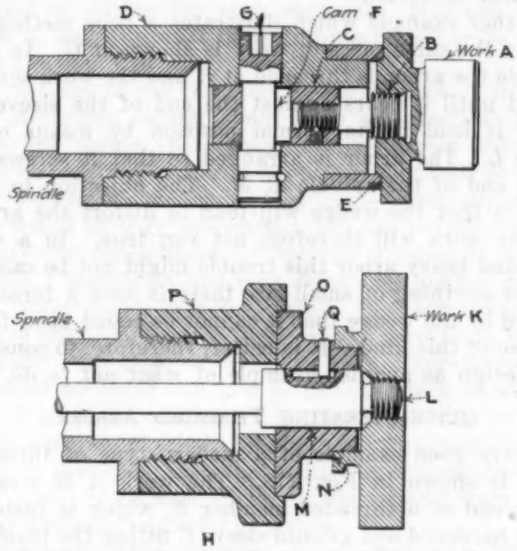


FIG. 278. QUICK-OPERATING THREADED-WORK ARBORS

shown, giving a slight relief to the portion *O* and giving the dimension on the arbor between the arrows at *P*, the toolmaker can readily measure these portions and the taper can be determined by giving dimensions *Q* and *R*. The total length of the arbor can also be given to the point *N*, but the diameter at this point should not be mentioned. A little care on the part of the designer will assist the toolmaker greatly on work of this character.

We have previously discussed the holding of threaded work when an outside method of locating is necessary. There are many examples, however, when the inside of a piece of work is threaded and the location must be taken from this for some other operations on the piece. Many of the principles which apply to the outside method of holding are also of importance in connection with arbors for threaded work. The simplest form of threaded arbor, but one which is not to be recommended, is shown at *B* in Fig. 276. The work *A* screws onto a plain threaded portion of the arbor and brings up against the shoulder at *C*. The pressure of the cut sets up a wedging action between the work and this shoulder, so that it is very difficult to remove the piece after it has been machined. An arbor like that shown

at *D* can be designed, however, which will give excellent results. This type is threaded at *E* with a left-hand, coarse-pitch thread on which the collar *F* is mounted. This collar is screwed up against the shoulder at *G*, thus forming an end stop for the work which screws against the portion *H*. Pin holes are provided in the collar at *K*, so that after the work has been machined the collar can be easily loosened and the work removed without trouble.

Fig. 277 shows a piece of work *A* which is screwed onto a threaded plug *B* located in a nosepiece *C* on the spindle of an engine lathe. In its general principles, this arbor is quite similar to that previously described, but the work is somewhat larger and the arbor is applied directly to the spindle, instead of being held between centers as in the other example. The portion *D* is threaded with a left-hand, coarse-pitch thread on which a collar *E* travels, until it brings up against the shoulder at *F*, thus forming the end stop for the work. The method of releasing the piece after it has been machined is obvious.

Another example which illustrates a poor method of holding the same piece of work is shown at *G*. In this example the arbor is threaded at *H* and the work screws onto it until it bears against the end of the sleeve *K*, which is held in its normal position by means of a wedge *L*. The arbor is arranged so that it screws on to the end of the spindle at *M*. The objection to this arbor is that the wedge will tend to distort the arbor, and the work will therefore not run true. In a very large and heavy arbor this trouble might not be caused, but for anything of small size there is such a force developed by the wedge that it cannot be relied upon for a purpose of this kind. It is better, therefore, to consider this design as another example of *what not to do.*

Quick-Operating Threaded Arbors

A very good example of a modern type of threaded arbor is shown in Fig. 278. The work *A* is screwed to the end of a threaded member *B*, which is fastened into a hardened and ground sleeve *C* fitting the inside of the nosepiece *D*. A hardened locating ring is provided at *E*, against which a finished portion of the work is drawn. The operation of the device is by means of a cam cut at *F* and operated by a socket wrench in the hole *G*. This cam bears against the rear end of the sleeve which pulls back the threaded plug. The operation of the device is very rapid and positive in its action. Care must be taken not to make the cam too abrupt, as a slight eccentricity is all that is necessary. The various parts of this mechanism should be hardened and ground.

The example at *H* shows a piece of work *K* having a somewhat different method of location from those previously described. The work screws on to a threaded plug *L*, which has a cylindrical portion fitted into the collar at *M*. End location is determined by the shoulder at *N*. The collar *O* is fitted to the nosepiece *P*, and carefully ground when in position so that the hole is perfectly concentric. The rod *L* extends back to the rear end of the spindle, and is operated from this point by the collet mechanism. The pin Q simply keeps the rod from turning, a slot being provided in the latter to permit end movement. A device of this type is very satisfactory and can be quickly operated.

Considerable care should always be taken when several parts are assembled on a faceplate or nosepiece to make sure that they are ground carefully, so that they will be perfectly concentric. The only way in which this can be done and be sure of the results, is to grind the parts in position on the machine on which they are to be used.

Judge Gary Speaks of the Future

Judge Gary, in his address before the Iron and Steel Institute, said:

"The resources of this country are so enormous and the necessities of the consuming public so extensive that there must be continuously transacted a large business, even though at times it is small when compared with the maximum periods.

"But it will be conceded that thrift even in a rich country may be interfered with, if not postponed. The pity is that often this is brought about unnecessarily and sometimes negligently or viciously. Even though we have now passed the most critical period in our recovery, I still think we would not be warranted in concluding we have arrived at the point where we can with certainty predict the exact time when there will be a return to a normal financial, commercial and industrial basis, for the world's economic structure has been terribly shaken by adverse winds during the last few years. There must be further adjustments. . . . The majority of reasons favor a return to large prosperity in the comparatively near future. Let us keep within the limits of our resources and be trustful. We should not anticipate much, if any profit, in our business during the present quarter. If there are losses it will probably be our own fault. Let us look up and ahead; look at the wealth of the country and not the present poverty of business. Let us bear in mind that in the long past we have, on the average, been well treated, and therefore in the future will probably receive still better consideration if we do our utmost to deserve it."

The Effect of Bolshevism Upon Russia

Status of the Kuznetskie Coal Basin and the Turkestan Irrigation Projects—Expressions from Lenin and Trotsky—Prevalence of Hunger Among the Workers

By ROYAL R. KEELY

AFTER a trip to Petrograd and to manufacturing plants in the surrounding districts, I returned to Moscow, arriving March 1, 1920. The next day I wrote Lenin, telling him that there was no production and could be no production in Russia for at least ten years, and I specified the reason—a painful shortage of material, fuel, transport, trained workmen, clothing and food. For the workmen whom they had, there was no incentive to work; they had no wish to work and the hard conditions made it impossible. Then I mentioned that all Russia could hope to do in the ten years would be repair work, and that she would be lucky if she could do that. (Since that time, large quantities of cars and locomotives have been sent to the Baltic provinces for repair.)

In the same letter, I expressed my desire to return to America. Lenin sent me to Rikoff, head of the Supreme Council of National Economy, who said, "Yes, we have heard that you are ready to leave Russia. We are willing that you should go. However, it is our desire to interest American capital in our natural resources and we want you to take the necessary data concerning them to America." This seemed to me, at the time, to be a means of keeping in touch with Russia, until reconstruction should come, so I told him that I would be willing to consider his proposal.

Rikoff turned me over to the "Concessions Department" and I spent three or four weeks in conferences with experts and specialists about the various branches of Russia's natural wealth—the forests of the north, the Donnetz coal fields in Ukrain in the south, and the great Kuznetskie coal fields in Siberia; irrigation in Turkestan; water-power around Petrograd and in the south; flax, grain, hides and the Volga-Don ship canal. I studied engineers' and geologists' reports, for it was of considerable interest to me to have this chance of learning of Russia's natural wealth.

The Kuznetskie Coal Basin

Finally Rikoff said, "It is not enough for you to see the reports and talk with the specialists in the various fields. You must see these things for yourself." "Yes," I said, "but that is practically impossible because of the destroyed transportation." He replied, "That would be true for the ordinary traveler, but we will make it possible for you." He then sent me to the railway department where they told me that they had instructions to give me the best train Russia could provide, consisting of a new locomotive, American coal cars with coal enough for the round trip, International Pullman cars for myself and staff of experts, dining car, food, three train crews for twenty-four hours' operation of the train, and an automobile for side trips.

The first trip which they proposed was to the Kuznetskie coal basin, halfway across Siberia, and some 2,000 miles from Moscow. There may be found good coal in great quantities. In the Ural mountains, between Russia proper and Siberia, is a mountain of iron where the quality is good and the situation such that mining costs would be extremely low. The problem then was to take the Siberian coal 1,000 miles east to the iron ore, which would involve the building of a special coal railroad, after the practice of our American coal roads, where records have been established in low costs of transportation.

The next trip they suggested was to the Turkestan irrigation projects, the development of which, as I explained in a previous article, would be extremely expensive and would require years.

Both required the development of a market. With the industries, the economical foundation, and the civilization of Russia destroyed, as it is, there can be no market or excuse for such ventures. Nor can I conceive of any capitalist investing his money so as to put it at the mercy of this robber band.

It seemed to me that the Bolshevik idea of interesting American capital could have no practical result. Also, my seeing these things in a hurried trip could have no practical or useful result. I went back to Rikoff and told him my decision—that to me personally, such a trip would be very interesting, but the result could not justify the expenditure. Whenever I spoke of costs in Russia, I invariably met with some such answer as this, "Oh, what do we care for costs? We own everything, we are the proprietors. There are no capitalists to reap a profit. All that we make is ours. For wages and material we print our own money, as much as we like, and it costs us nothing." It was impossible to make them understand, that, by their clumsy, wasteful, inefficient methods, their necessities and products must cost more in human effort, drudgery and pain, than under the old "capitalistic system."

As a result of my request, Rikoff gave me a letter to Tchicherin, head of the Foreign Office, asking for a vise. I was told at the foreign office it would be necessary to get permission for me from Reval. After waiting two or three weeks, I was told that the agent in Reval must get permission for me from Washington.

Finally on May 1, 1920, I received all permits, documents and vises. One coming from the land of capitalistic oppression, America, to this wonderful land of freedom, Bolshevik Russia, must be astonished at this matter of documents. At home, my birth was never registered, and I lived my entire life and made trips to Europe, without a single official document of any kind—nothing to officially prove my birth, age, nationality or profession. But in Russia, people are loaded down with documents, an official passport, a compulsory labor book, permits for food and food cards, permits for a place to live, permits to ride on the street car—one to say you are permitted to ride, and a second to say that you are the person named in the first. In America, if one wishes to go somewhere, he buys a ticket and gets on the train. In Russia, five or six or seven documents are required, signed, counter-signed, and red-stamped, which it requires from one to two weeks to secure. Then, after your permits are secured, you must go and stand in line for your railway ticket.

With all my vises and permits, my baggage inspected and censored, an automobile was sent on May 7, 1920, to

take me to the railway station. A coupé had been reserved for me in the courier car direct from Moscow to Reval, without change. White bed linen was provided and food for the journey was sent from Kremlin, the "Festung" of Bolshevism.

Before leaving, Lenin admitted me to his presence. We talked for a half hour of Russian difficulties. He told me of their success and how they would succeed in the future, in spite of all the opposition of capitalism. He tried to draw me out by suggesting, "I suppose you will have much to relate in America of the destruction in Russia." I replied simply that I had no desire or time to meddle in political affairs and would be busy making a living when I returned. But the order had already been issued for my imprisonment, although I did not know it at that time.

The Penalty of Knowing Too Much

On May 11 I arrived at the border at Yambourg. Three armed soldiers came to my coupé and said the commandant wanted to see me. Up to that time, I had had all that starving, destroyed Russia could offer—a good room, good food, secretaries, and freedom to travel and to see and learn of the real conditions. But this was my crime: I had seen and learned too much and the Bolsheviki did not dare to let me go. Therefore, the comandant at Yambourg, said, "There is a mistake on your passport. The numbers do not agree with those on our records and Esthonia objects." But the Esthonian agent had already vised my passport so that I knew he was lying. All day I sat in the office of the commandant and waited. He was deaf to my demands for explanation or action. At night, he turned me over to the local "Tcheckah," "The All Russian Commission for the Supression of Counter Revolution." These "Tcheckahs" have grown into a giant octopus, drunk with its power, always robbing, ever imprisoning and murdering those whom they have any suspicion of opposing their will. While they work inefficiently, they work effectively, because of the immense number in their employ. One never knows when he is speaking to an agent of the "Tcheckah." Many times they adopt the attitude of an anti-Bolshevik, simply to draw one out. Many of their best spies are women, nicely dressed and well fed, who live on the fat of the land.

After a session of the "third degree," which lasted from eight in the evening until eight in the morning, I was loaded, with my baggage and my three soldiers in a third-class coach and we returned to Moscow, when my prison life began.

The Bolsheviki have been successful in two things: first, in bringing every one down to the level of the lowest in pre-revolutionary times, and in destroying all the wealth of Russia; second, they have succeeded in destroying and suppressing all opposition. The prisons in Russia are always filled. They have taken all the prisons of the old regime, and to them have added many improvised prisons, such as the various monasteries of the cities. They have also had, scattered through the various villages, at the railway stations, ordinary freight box cars, which were used as temporary jails. They were without heat, and in the winter months were not very comfortable places for human beings. The leaders of other political parties are mostly in prison. Other members who are not in prison are scattered and prevented from communicating with one another.

Lists are constantly being circulated, demanding the full history of each individual. In reply to the question of political party, these various politicians usually state "non-partisan," for if they signified their allegiance to any other party, it would lead to persecution, possibly to imprisonment.

But in the prison is really the best place to study the Russian situation, for there is freedom of speech and less fear. The prisons are filled with those who have asserted themselves or in some manner expressed their individuality. They come from all over Russia and the personnel is constantly changing. The foreigners in prison, however, have had it far easier than the average Russian. Few of them have been shot, while the native is in constant danger. His relatives have to endure the greatest hardships and in prison or out makes little difference, for no Russian is allowed to leave Russia or to move from place to place.

One well-known Russian, who was a student of English with me, had been formerly a wealthy man and had owned a large estate. He had taken a great deal of pride in making his farm the best possible by introducing the most modern American and foreign machinery and equipment. He bred fine stock and was rendering a great service to Russia by demonstrating the better farming methods and bringing to his farm the best scientific foreign agricultural methods. Everything perishable on his estate was completely destroyed, the stock stolen and killed. And the sorrowful part is that no one has profited. I think the loss to Russia and her civilization is greater than to him personally, for he has health and youth and has not yet been shot. When the opportunity comes he will regain his losses far quicker than the nation will. He told me that before coming to prison he had always fear of prison, he was always hungry, his whole day was consumed in the most trying physical matters in connection with his struggle for a mere existence, staving off starvation. In prison he had quiet and rest and little fear of disturbance with only two hours' work per day.

Autocracy Has Increased

Few in the outside world can realize that in Russia today there is a more strict and destructive autocratic power than has ever existed before. Nowhere else in the world is there so little liberty. Freedom of speech—that is unknown. Freedom of the press—a joke.

Let me quote Lenin's own words: "We have arrived at autocracy," and "The object of the Communist Internationale is a struggle with force of arms for the suppression of the internationale bourgeoise and the creation of an international Soviet republic as a transition stage for the complete suppression of the State. The victory is incomplete until every part of Europe is revolutionized." Again he says, "In the autocracy of chiefs of communism and the communist domination of the people lies the pledge of our success." Also, "There can be no liberty or democracy," but there "must be submission to the armed vanguard of the proletariat. . . . We must know how to apply at need, knavery, illegal methods, deceit, hide truth by silence," etc.

Trotsky, the other leader of the cause of freedom and liberty for the worker and peasant, says, "All artisans will be sent into the world and transferred from one place to another according to the indications of the government. We will have no pity for the peasants; we will make labor armies of them, with military discipline and communists as their chiefs. The masses of the workmen should be moved about, ordered and sent from place to place in exactly the same manner as soldiers."

Unemployment in the Metal Trades

In Comparison With Other Trades, the Metal Workers and Printers of New York State Are the Most Steadily Employed

BY ERNEST S. BRADFORD
Economist and Statistician, Member of President's Conference on Unemployment

AMONG the charts presented at the President's Unemployment Conference, held recently in Washington, was one comparing the unemployment in the metal trades with other trades, such as printing, the building trades and clothing in New York State, and covering a series of years. The data on which the charts are based were collected by the statisticians of the New York State Industrial Commission for each month, beginning with 1904 and continuing until 1916. They cover, therefore, a long enough period to be significant of trends in the industries, and are believed to be typical, in many respects, of conditions in the metal trades throughout the country.

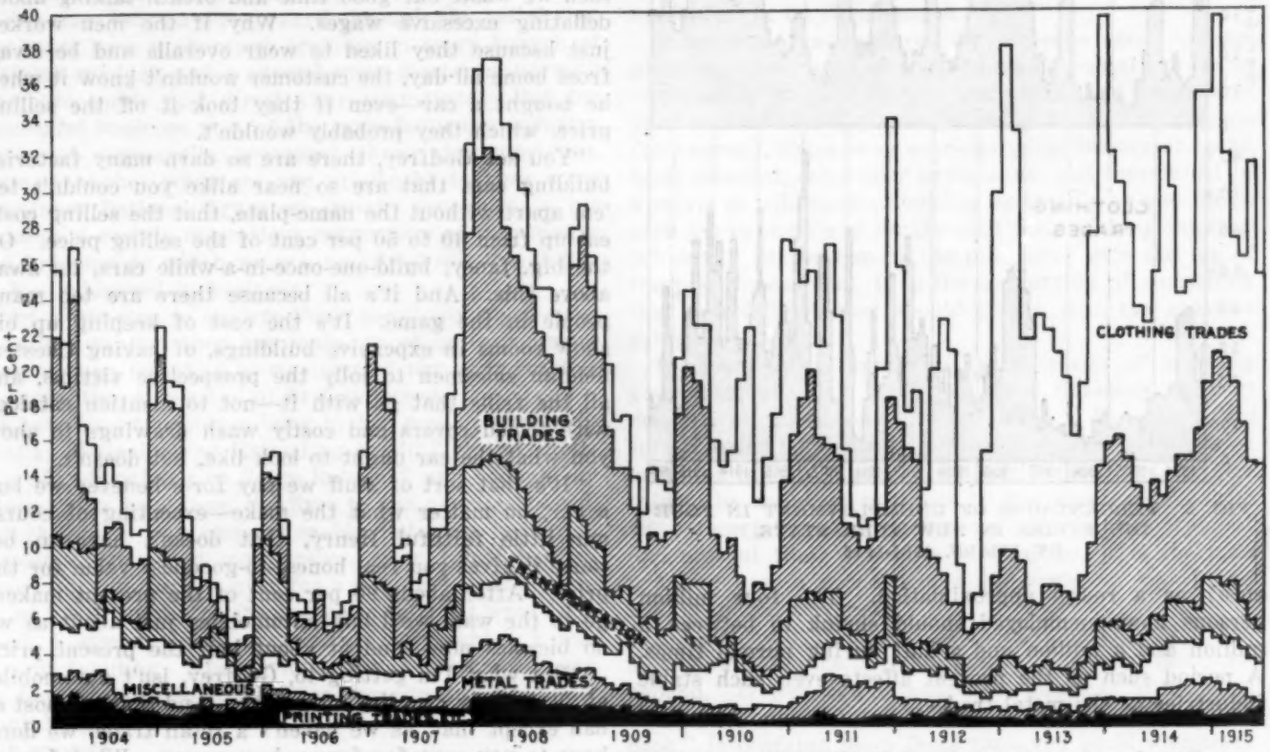


FIG. 1. PERCENTAGES OF UNEMPLOYMENT IN INDUSTRIES OF ORGANIZED LABOR IN NEW YORK STATE, BY MONTHS, 1904-1915

UNEMPLOYMENT SITUATION COVERING TWELVE YEARS PREVIOUS TO 1916

The charts show the percentage of unemployed among organized wage earners at the end of each month, winter and summer, for more than twelve years, the practice having been discontinued in 1916. Of the four industries covered by charts, Figs. 1 and 2, two have a comparatively low average of unemployment, namely, the metal trades and printing; while two others, the building and the clothing trades, have very high percentages of unemployment and a wide range between the high and low points.

The metal trades are a comparatively stable industry. The fluctuations shown on the chart indicate that they are less subject to seasonal variations than to the influence of depressions and periods of unfavorable business. The depressions of 1908 and 1914, and the dull business conditions of 1911 are all reflected in the higher percentage of idleness in machine shops. In this respect they are in marked contrast to the building trades, which have both a periodic and a seasonal curve, the percentage of unemployed rising sharply to a peak each winter and falling to a low point during the summer.

The chart, Fig. 2, shows even more clearly the relative stability of the metal trades and printing, in New York State, and the high unemployment in the building and clothing trades. While the exact percentages in the two latter industries are probably greater in this state than in the country as a whole, it is clear from other data that they will generally average higher than the metal trades.

The inclusion of unemployment due to sickness and strikes, not a large amount on the average, when compared with unemployment due to lack of work, does not materially change the curves of the charts, except at a few points in the clothing trades.

PRESENT ABNORMAL UNEMPLOYMENT VS. UNEMPLOYMENT IN NORMAL TIMES

The present situation is not normal, the average unemployment, estimated frequently at about 10 per cent of all manufacturing employees, having risen to about 25 per cent (the percentage arrived at by the subcommittee on statistics of the Unemployment Confer-

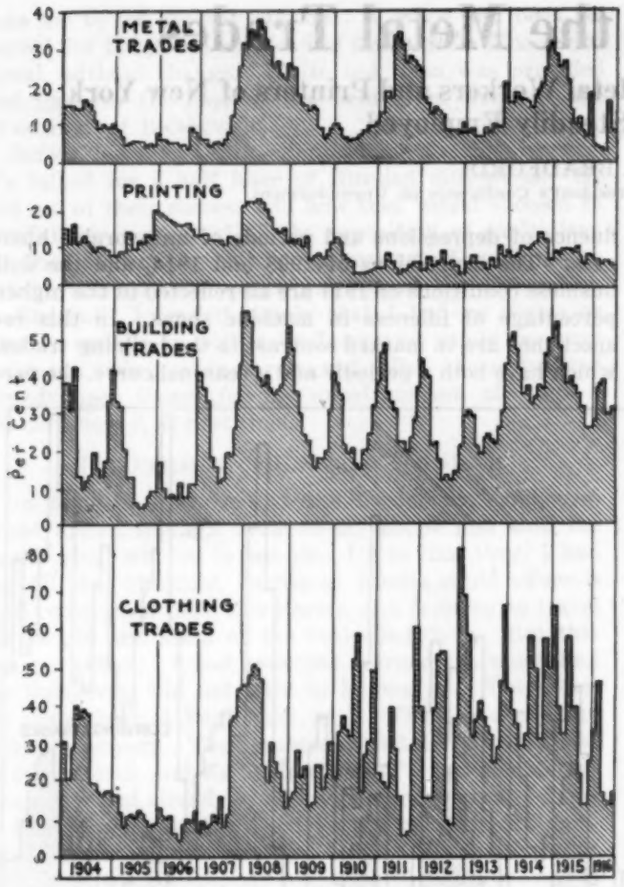


FIG. 2. PERCENTAGES OF UNEMPLOYMENT IN FOUR INDUSTRIES IN NEW YORK STATE, BY YEARS, 1904-1916

ence) as a rough approximation. The four million persons now unemployed should shrink to between a million and a million and a half during normal times. A period such as the present affects even such stable industries as the metal trades.

Production Costs and Selling Prices

BY JOHN R. GODFREY

When Johnson was going around the country getting dope on how to run machine tools to the best advantage, he also picked up a little other information on the side. And it opened his eyes wider than they've ever been before. He sort of boiled over the other night when we met on the train, and unburdened his soul of some of his discoveries.

"Godfrey, old man, we've been paying all our attention to the wrong thing in the machine business. Being mechanics we've naturally thought only of production and we've chased a dollar in this department 'til it begged for mercy. And all we've saved hasn't added a dollar to our bank account or saved the customer a cent. It gets lost down along the line long before it gets to him.

"We've plumb overlooked the fact that the cost of direct, productive labor is a darn small part of our total. We've crowded up on time, we've bought new machines and new steels to save a few cents in production time and thrown it away in cost systems and things which eat up more than we realize. But most of all we're weak at the selling end—hence the fancy salaries and commissions, the plaid trousers and the spats on the fellow who sells the stuff we make. Doesn't always know much more about a motor than a cat, but he has a line of talk that puts the name on the dotted line and he gets three times as much for that as the shop men for making the whole motor.

"I ran into one motor shop—a big one to be sure—where they have a wad of special high-priced and high-production machinery. The machine overhead is high, of course, but the labor cost on a four-cylinder motor block, complete and ready to assemble—is a shade over 60 cents.

"Another car that sells for about $1,100 has a total labor cost of $62 and one of the high-grade cars that sells at about $2,500 costs about $250 for labor. And then we waste our good time and breath talking about deflating excessive wages. Why if the men worked just because they liked to wear overalls and be away from home all day, the customer wouldn't know it when he bought a car—even if they took it off the selling price, which they probably wouldn't.

"You see Godfrey, there are so darn many factories building cars that are so near alike you couldn't tell 'em apart without the name-plate, that the selling costs eat up from 40 to 50 per cent of the selling price. On the big, fancy, build-one-once-in-a-while cars, its away above this. And it's all because there are too many people in the game. It's the cost of keeping up big show rooms in expensive buildings, of having Chesterfieldian salesmen to jolly the prospective victims, and all the frills that go with it—not to mention catalogs with tooled covers and costly wash drawings to show you what the car ought to look like, but doesn't.

"It's that sort of stuff we pay for whenever we buy a car, no matter what the make—excepting of course our little faithful Henry, that doesn't have to because it gives you real honest-to-goodness value for the price. After about 90 per cent of the present makers go to the wall, we'll buy automobiles just about as we do bicycles now—and at about half the present price.

"But what I'm getting to, Godfrey, isn't automobiles at all, but my own line of motors. And that's almost as bad except that, as we haven't a retail trade, we don't have to pay rent for fancy show rooms. What I want to know is, how can I cut out a lot of indirect labor such as superintendence, selling costs, etc.?

"If I can do this and reduce my selling price, can I expect a larger demand? Or, are there too many motor builders now and if so am I in the list of 'stayers' or 'goers'? Does it mean consolidation or elimination in my particular case? I don't want to kid myself into thinking I've got a good chance to survive, if I haven't. I'd better quit now while my credit is still good, at least.

"I'm dead sure we have too much motor building capacity in the country for a long time to come. That means we've tied up altogether too much capital in the industry. It ought to be working somewhere else. Perhaps I ought to quit voluntarily and go to raising hell—or chickens, down on my farm. Wish you'd think it over and let me know what you think about it, Godfrey. Haven't given you a chance to say a word, I know—but drop in and talk it over with me soon."

Johnson touched a tender spot with me in his monologue. He's dead right about the overcapacity, but I don't see him among the quitters by a long ways. I believe he'll work out a way to stay in the game because he likes it and knows it and thinks it well worth while.

Organization and Management of the Small Shop

X. Qualifications of a Successful Executive—Co-operation Between Producers and Management—Taking Employees Into Confidence—Modern Business Ethics

BY ELMER W. LEACH

IF YOU glance back through the several articles of this series and notice that each one deals with a separate and distinct phase of small shop organization and management with which you must be familiar if you are to be successful, it may cause you to suspect that in order to profitably conduct a small manufacturing business you must be a many-sided specialist.

You may become discouraged through the belief that you must have a thorough training in every branch of business conduct, and a super-human master mind with which to guide and direct your operations. But the successful business men of the manufacturing industry have not necessarily possessed those characteristics. True it is that when we are privileged to hear some prominent national figure we usually recognize in his make-up a certain mysterious magnetism of personality and influence to which we can readily credit the ability he has evidenced in business.

Yet if we stop to analyze those seemingly mysterious qualities, we find they are made up of quite commonplace virtues, not at all as complicated nor as impossible of duplication as we had at first supposed.

I have heard inspiring talks by big men on such subjects as "Principles of Extending Credit," or the "Relation of Advertising to Sales Return;" and though my interest was held from the first to the very last word, and though I was unquestionably listening to a real message, I found in many cases, after I had had an opportunity to think it over for a few days, that a number of the thoughts the speaker had presented were facts which I already knew or methods with which I was already familiar. The obvious things, which we may not have stopped to consider as important, are usually coupled together to produce the sort of bigness that goes with success.

To be successful requires ability, but it need not necessarily be the sort of ability that requires a university degree or a linen collar. If a man knows how to work hard and is willing to work hard, if he understands the product he is making and the market he is entering, and if he knows how to judge the relative value and importance of things, he stands a mighty good chance of being favored by Fortune with a successful career. I say a man must know how to work hard, because nothing comes easy in business. There is a definite ratio between effort and return; and the man who believes he has a "duck soup proposition" should quit before he starts.

When we come to a hill we don't shut off the gas—we step on the accelerator harder than ever to give the car the greater power that will send it over the top on high. And it is exactly the same in business. We are confronted with a succession of hills and valleys, and when we come to the hills we must step on it *hard* if we are going to make the grade. In these days the grade is especially steep, and it is certainly hard to understand why some men should accept conditions as an excuse or an alibi to "lay down." Present conditions have proved a real opportunity to the men with clear vision and foresight, and where one man slows up because he lets people tell him that business is rotten, the other man steps on the gas and gets the business that was there for the going after.

A man must also not only be *willing* to work hard—he must *enjoy* working hard. You can no more expect to be successful in business if you do not enjoy your work than you can hope to have a real home if you are not happy in its development

When you are employed by someone else, you are given a certain kind of work to which you are probably particularly fitted. That is your task, and because of your aptitude for it, you enjoy doing it. But in business for yourself, there is an ever-changing variety of tasks, some pleasant, some very unpleasant; and there must be a spirit of willingness showing up plainly as you tackle each job to make way for the next job. Picking the easy job out of the bottom of the pile never gets the top of the pile cleaned up. It is the conquering of something that was difficult that should give a man the greatest satisfaction.

We have talked before of the necessity of knowing your product and your market. Business conduct depends on facts, not on guesswork. And yet I am sure that the man who said "Only fools are certain, wise men stop to think," must have been in business, for certainly the soundest business is at times and in some ways uncertain. And when those uncertainties crop out and present their annoying perplexities, it is the man who can base a decision or a judgment on *knowledge*, who is indeed fortunate.

For after all, it is not the facts themselves, but the ability to use them, upon which business decisions depend. If you could conduct a business with mere facts, you might buy an "American Machinists' Handbook." It contains more facts than you could memorize in a hundred years. But the "American Machinists' Handbook," simple and complete as its tables may be, must be backed up by the ability to think if those tables are to be usable. The ability to determine the relative importance and value of things is truly (if I may quote Shakespeare) "A consummation devoutly to be wished."

In the early days of your small shop you will probably be "the whole cheese." Your volume of business, your limitations of capital, and a number of factors will combine to keep you busy on detail work of various kinds. But there comes a time when you may have a man who puts in his entire time packing and shipping. You wonder if he can be entrusted with the detail of making out the bills of lading, or marking the crates, or determining the roads over which the shipments should be routed, or deciding upon the sequence in which the orders should be filled. Right there is where you will sink or swim, according to your decision. A man's ability as a manager depends upon his ability to divorce himself from detail work. If you cannot have confidence in that other man's ability, and through that confidence clear your own mind so it is free to grapple with bigger problems of broader scope, your small shop will always be small.

The value of your own time depends entirely upon

how it is limited by the valuation that you place upon it through the way you use it.

I know a gentleman who a year ago owned a substantial interest in a comparatively small manufacturing plant that bid fair to develop into a much larger organization. But he was always complaining that he had so much to do that he didn't know where to start. His partners soon sickened of that sort of thing, and arranged to employ a man who would take charge of everything that smacked of "office work," so that my complaining friend could devote his entire time to creative and experimental work, and be free from worrying about the details of shop supervision.

But the new arrangement didn't last ten days! Why? Simply because a man who had organized a business could not prove himself big enough to let someone else handle the details. It may be of interest to add that this gentleman is now working in a garage repairing cars when he might have enjoyed this year a good salary and a four-figure dividend besides.

One other thing that must be indelibly written upon your convictions is the fact that "times have changed since father was a boy," and the personnel of a shop is no longer divided into the two former diverging classifications of "the boss" and "the men."

There was a time when a man was only considered as a part of his machine, and labor was bought and bargained for the same as any other commodity. The theory that capital and labor had nothing in common was advanced, and possibly justly so. But those times are past; fortunately, we can believe that they are gone forever. There is no problem today that interests an employer so keenly nor to which he devotes more serious thought than the problems of his employees. He wants conditions in the plant to be such that the workmen will be contented and congenial. He wants them to know that their troubles are his troubles, and that they can always feel free to come to him for advice and counsel.

Employers now realize and like to have the men understand that they are not working *for* the management, but *with* it. True it is that age and ability give different men different capacites for accomplishment, and so to each one there is designated the niche that he is to fill in the scheme of things. But no individaul is independent of any other individual, and the same thing is true of groups. If there were no shop men, there would be no product to back up the merchandising efforts of the office force. And if there was no office force, the shop men could not dispose of the product they built. So the two groups are really one big group, and all kinds of effort are closely interwoven to produce the smooth running organization.

One of the things we like to have the men in our factory surely understand is that a part of the labor of every man in the plant goes into the building of the goods we send out on every order. When the men realize that fact, the fellow at a lathe does not think that his job is merely to machine castings. He gets the broader viewpoint—he sees that he is just as important a cog in the wheel of giving service and making sales as anyone. He is helping to get orders and to fill them just as much as are the sales manager and the shipping clerk. If his work is good, it helps make the finished product good and helps make that finished product easy to sell. If his work is turned out on time, he helps give prompt service and helps the sales department back up its promises of quick delivery.

So shop magazines, employees' clubs, welfare committees, and plans of self-government and participation in profits are finding their way into the management of factories, and employer and employees have closed the breach that was formerly supposed to keep them apart. Managements are taking their men more and more into their confidence regarding the progress of the business. The average workman in the average shop used to believe that about twenty-five cents out of every dollar of sales went into profits. A majority of them would have called their employers liars if they had been shown financial statements giving actual conditions.

But the new trend of practice has changed all this. It is a good plan to make up a chart showing the division of every dollar of sales. Probably material and labor take care of half of it. Then there is sales expense, interest, taxes, rent, depreciation, advertising, and a host of other items; and in any number of plants where employees might have thought that the war offered opportunity for hog-wild profit making, the chances are that not more than four or five cents out of each dollar of sales went into profit. But with the enormous volume of business that came with the war, it was sound judgment for most manufacturers to operate on a smaller margin than before. And when the men in the shop see what a slice of the dollar their labor represents, they usually can understand how little a drop in their individual efficiency it takes to entirely wipe out the thin slice for profit.

It has usually proven rather startling to make out a chart showing what it means if every man stays away from his work one day a month. Usually a man thinks, "Oh well, they'll never miss me today; they can get along all right without me." But if you figure that practically all the overhead expenses go on just the same whether every man is at his machine or not, and if you set those overhead totals up against the decreased production that results from every man not being on the job every day, you will probably give your composure quite a jar, and present yourself with some information well worth a lot of study.

A Guiding Thought

This article concludes the series in which I have tried to give from my own experiences in business some practices and theories that others might use as guideposts in charting their ships of promise through the uncertain channels that lie between the Sea of Insecurity and the Port of Sure Results. Though I have put a great deal of thought and work into the preparation of what has gone before, I should prefer that it all be forgotten as is the casual reading of an idle moment rather than have you overlook the thought with which I close.

And this is that thought: do not ever let the smallness of your shop prevent you from being big in the observance of the principles of business ethics.

Your shop, in fact, will not be known by the size that might show up in a photograph, but by the bigness displayed by the men who manage its affairs. That bigness will be evidenced by adherence to originality in design of equipment, by clean methods of advertising and sales promotion, by fairness in reference to or contact with competitors, and in other similar ways. If you have actually conceived the design of something new that seems to fit into some corner of the world's requirements, other manufacturers who may happen to be filling their portion of that same corner

will not object unreasonably when you take your place in the crowd. True, they will take steps to meet the changed conditions which your competition may bring about; but as a general rule, their competition will be clean and above board as long as yours is.

Everyone in business is trying to get as much business as possible, trying to develop his business to as large a volume as possible; but we all recognize the other man's right to existence. It is only the trouble-maker to whom we deny that right—the man who upsets everything by his utter disregard of all that is fair and square.

Fortunately, mortality among trouble-makers is high; but even during their temporary intrusion they can tear down what may have taken years to build. For one thing, they are often content to follow the line of least resistance in designing their equipment. They are satisfied to "grab off a chunk" of the other fellow's market, rather than create a market of their own. Usually they are clever enough to be able to do this without making themselves legally liable, but such methods are typical only of the "fly-by-night" manufacturer, and the trouble-maker invariably pans out to be that kind of fellow. In going after business they overlook the possible merits of their own product, and play constantly upon the seeming faults of competitive goods. The world is too full of knockers as it is, and so the man who tries to market his own product by knocking another usually fails.

I like a booster. I should think that everyone would like a booster, even though he might be one of the "toot your own horn" type; for in business it is often necessary and desirable to do a little horn-tooting to call attention to something you may want to emphasize. We are all proud of the man who is trying to lift himself up by building his own organization of bricks that are solidly cemented into place, one carefully laid on the one underneath; but only a very few (and the value of their support is most questionable) approve of the man who tries to make an entering wedge by featuring possible weaknesses in products he may be wishing to replace.

The Spirit of Modern Business

Co-operation has placed a new meaning to competition. Through trade associations and other agencies we are meeting our business competitors on equal ground to discuss together our common problems. A spirit of mutual helpfulness has taken the place of the old-time suspicion that made your competitor step over to the other side of the street at your approach, or become visibly uneasy around the collar when circumstances may have made it impossible for you to avoid collision. Those were the methods of "the old school." Only in very exceptional cases will you find them practiced in the business world as you will enter it. It is well that you should know of these new conditions, for when a shop is small, the time frequently comes when some slight variation from common practice may appear to bring an advantage. But the advantage is always temporary, if it is there at all, and the reaction at some later time will surely offset any possible gain.

In contrast to the shop where copying of design, duplication of sales methods, cutting of prices or rates, indiscriminate extension of credit, haphazard granting of dealer's or jobber's terms without definite knowledge of the established standing of that dealer or jobber, is that new type of manufacturing shop that I ask you to keep ever before you as the ideal after which your own business will be patterned. It may be housed in a small building, but in its unpretentious way it is setting a mark in its own sphere of influence. By the honest methods which characterize its conduct, and by its careful avoiding of all that has been proved detrimental to the best interests of men in business, it has definitely proved that there is a logical place for the small shop in the field of manufacturing endeavor.

To the owner of such a small shop, I cannot help but wish that we might draw aside the curtain which hides us from the future, and catch a glimpse of what a few years of effort will bring to him. I am sure we would see a large plant of which he might justly be proud; we would see a distribution of his product that would indicate a real accomplishment in merchandising; we would be shown a financial statement that would reflect unquestionable ability as a business leader.

Truly, it would be a small shop grown big through organization and management.

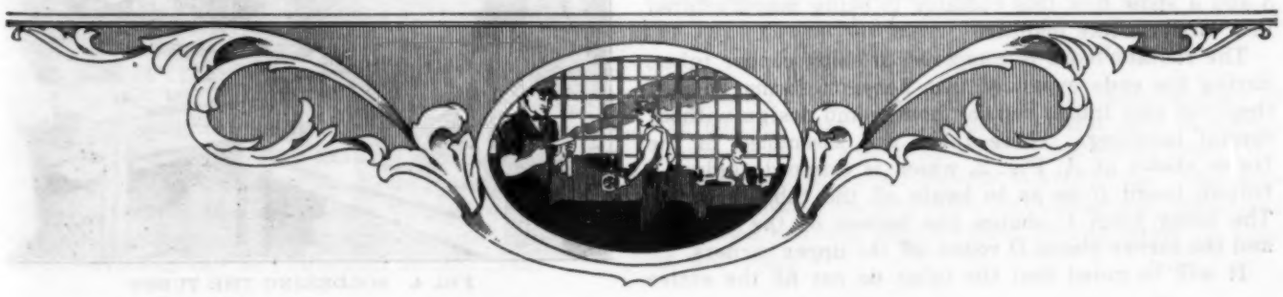
Piston Work in Motor Repairing

By F. L. Nichols

I would like to add a little to the author's remarks on the fastening for piston pins, in the article on piston work in motor repairing, page 473 of the *American Machinist*.

Don't use casehardened setscrews with fine threads. A heat-treated screw is all right, but casehardened ones jar loose on this job quickly. I might also add that this holds true with adjusting screws on valve lift rods.

As to the oil holes in the piston pin, if you must put them in, be sure to put them toward the side in the piston rather than at the top or bottom. I have in mind two makes of cars built several years ago. Both used a hardened pin with a hardened bushing in the piston end of the rod; both used splash oil feed; both had two countersunk holes in the top of the rod to feed oil to the pin, with pins of practically the same size in both engines. The cars in which pins without holes were used would run several years without having to have new pins. The other make of car had four holes at the top and bottom of pins, allowing oil to dodge out when the pressure came on the pin and the engines would knock badly if new pins were not fitted each year.



Getting Airplane Details on a Manufacturing Basis

Economical Methods in Radiator Construction—Soldering Tube Ends in Multiple—Punches and Dies for Fittings Made Adjustable by Insertion of Loose Pieces

SPECIAL CORRESPONDENCE

ONE of the necessary requirements for the development of the airplane industry is a simplification of design and sufficient standardization to enable parts to be built in large enough quantities so that the price may be brought within reason. It is interesting to

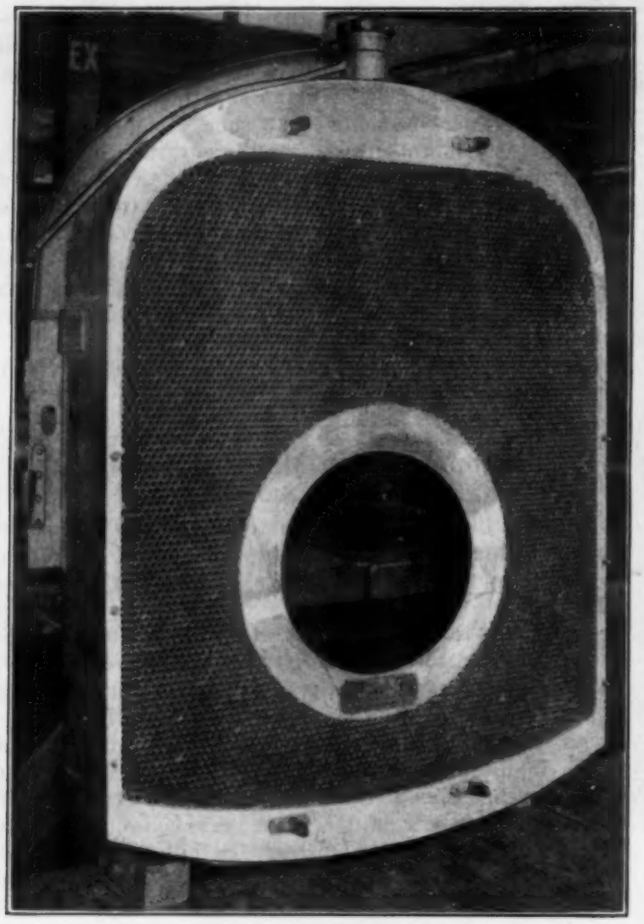


FIG. 1. COMPLETED AIRPLANE RADIATOR

note that the Curtis Engineering Co., Garden City, Long Island, N. Y., is making strides in this direction, two interesting examples being illustrated herewith. Fig. 1 shows a completed radiator which can be applied to a nuumber of different types of planes, while Figs. 2, 3 and 4 show how this radiator is being manufactured in a business-like manner.

The radiator core is composed of short copper tubes, having the ends expanded into hexagon forms, so that they will nest into a regular honeycomb design without special handling. These tubes are assembled in the frame shown at *A*, Fig. 2, which is clamped against a bottom board *B* so as to locate all the tubes endwise. The lower form *C* shapes the bottom of the radiator and the corner pieces *D* round off the upper corners.

It will be noted that the tubes do not fill the entire space, but are laid in around a circular piece *E*, which leaves an opening for the engine shaft where it projects for the propeller hub connection. A completely filled form is shown in Fig. 3, the tubes being all ready to have the ends soldered.

The soldering is done as shown in Fig. 4. Extra clamps are put on the mould, as at *A* and *B*, and two men then handle the core as shown, lifting it away from the bottom board and dipping it first in the acid tank at the left and then in the melted solder, as shown in the illustration. Suitable gas flames keep the solder melted and enable the radiators to be very quickly handled. By using this frame, which allows both ends of the tubes to project as much as necessary,

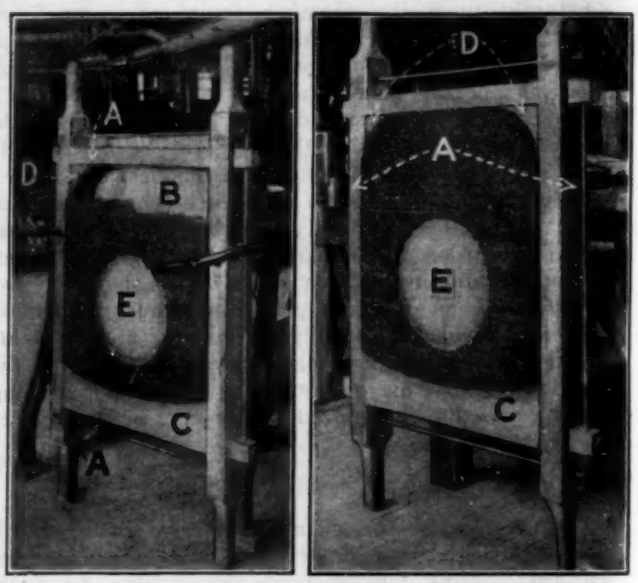
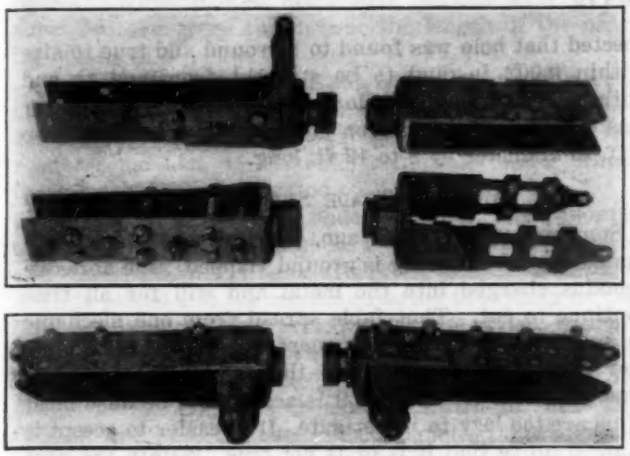


FIG. 2. FILLING THE CORE FRAME. FIG. 3. FRAME FILLED READY TO SOLDER

FIG. 4. SOLDERING THE TUBES

both ends can be easily soldered by simply reversing the frame.

Several fittings used in attaching wing sections to the fuselage are shown in Figs. 5 and 6. Fittings of this kind have in many cases been extremely expensive owing



FIGS. 5 AND 6. AIRPLANE FITTINGS FOR WINGS AND FUSELAGE

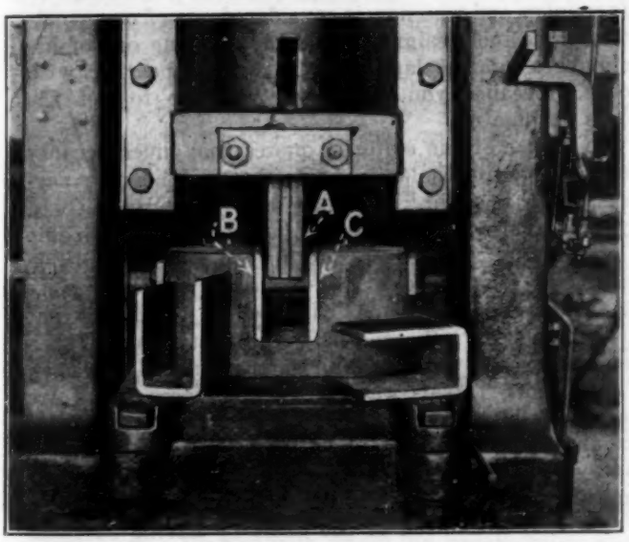


FIG. 7. ADJUSTABLE PUNCHES AND DIES

to the fact of their being built in very limited quantities, and in some cases, machined from solid forgings.

As a method of reducing costs in cases of this kind, the Curtis company is forming some of its fittings in the press shown in Fig. 7, using very simple punches and dies, as can be seen. The punches are built up of flat steel, and can be easily varied in width, as shown at *A*. The side pieces in the die at *B* and *C*, can also be easily changed to suit the particular fitting. Two of the pieces formed are shown in front of the die.

The way in which the fittings are used can be seen in both Figs. 5 and 6, particularly Fig. 6. Here the formed fitting is supplemented by a comparatively thin sheet steel lining which extends as far as necessary along the spar or other wooden part of the wings. This has greatly reduced the cost of many of the fittings and is a step in the right direction. These costs add tremendously to the expenses of building safe and substantial airplanes and it is only by findnig less expensive methods, especially as to the time required, that commercial aviation can be stimulated at this time.

American Tractors in Foreign Lands

Modern implements and tractors are now being extensively used in Tunis, according to a report received from Consul Harris N. Cookingham, at Tunis, and the demand is increasing, owing to the fact that the area of land under cultivation is being gradually extended. The labor shortage, which is particularly acute during the harvesting season, is a factor which has an important bearing on the demand for implements which are required to supplement the deficiencies of th labor supply. The sizes of the farms vary from 600 to 750 acres, and the purchasing power of the owners of fairly large farms is sufficient to enable them to purchase modern implements. The United States supplies most of the implements used in Tunis.

There are at present about 600 tractors in the country. In introducing tractors there is a certain amount of conservatism to overcome, but once the farmer is convinced of the superiority of mechanical traction over the draft animal, he becomes very enthusiastic about tractors. The farmer's lack of knowledge of the intricacies of machinery and motors and the lack of good mechanics in the country are serious drawbacks, and the importance of service in connection with the sale of machinery, and especially of tractors, can not be too greatly emphasized. The types of tractors best suited for use in Tunis are not specified in the report, nor the horsepower required. Prospects for the sale of tractors in Australia are good, according to a report recently received from Trade Commissioner A. W. Ferrin.

The report mentions four obstacles to the introduction of tractors on a large scale, all of which, however, will in time be overcome. The most important of these obstacles is the adverse exchange rate, which raises the price of the American tractor to a point which the farmer considers nearly, or quite, prohibitive. The high Australian tariff is another obstacle, but under an amendment to the tariff act recently adopted, providing that tractors "which are not produced in Australia" shall pay a duty of 10 per cent instead of the 40 per cent duty now charged on all tractors, the duty will be materially reduced on those types not made in Australia. The decision as to the types of tractors that will be affected by the amendment has been left to the new tariff board, which has not yet been organized.

There are at present three Australian firms manufacturing tractors of the round-wheel type, and another concern, the Murnane Tractor Co., is now being organized. Of these tractors the Sunshine, manufactured by H. V. McKay, is the most important. The Jelbart, manufactured by Jelbart Bros., is an oil-burning machine, which is making considerable progress and which shows great economy in cost of fuel as compared with kerosene and gasoline burners. The third machine is manufactured by MacDonald Bros., who, while continuing work on their tractor, are devoting most of their energies to making road rollers.

American Cars Win Test

American cars, which made up the greater part of the entries, won the reliability contest held in Christiania on Oct. 1 and 2, according to a report from Consul General Alban G. Snyder, Christiania. The contest was over a route of some 700 kilometers; speed was regulated and was not to exceed 75 kilometers an hour at any place.

Hand Versus Machine Finished Bearings

The High Cost of Precedent and Prejudice—A Comparison of Machine and Hand-Finished Surfaces—Some Examples of Better and Quicker Work

By E. A. DIXIE

THE editorial on page 571, Vol. 54, of the *American Machinist* under the above caption carries a sound workable suggestion which if followed would, I believe, revolutionize our present methods of finishing both cylindrical and flat bearing surfaces. But precedent and prejudice have such a grip on us that I fear it will be a long time before makers of machine tools will have the courage to finish flat and cylindrical bearing surfaces by machine. It will be a still longer time before they will be able to convince machinery buyers that properly machine-finished bearings are, at their worst, better than the best hand-finished ones.

People are accustomed to buying machine tools which have scraper marks on their bearing surfaces, yet nine buyers out of ten are not competent to distinguish a well scraped approximately flat job from a fancy piece of "frosting" which is anything but flat. To the uninitiated the poor job is usually more attractive than the good one. To an expert the fancy work of the ornamental scraper hand is an abomination. He knows that it is often a disguise put on to hide poor machine work. The less flagrant examples of real scraper "fitting" show undeniably that an attempt has been made to make the work flat and not fancy. But the average buyer of machinery does not know this or if he does he heeds it not.

The Fallacy of Hand-Scraping

Because some machined surfaces are not as accurate as some which have been finished by hand it is going to be a difficult job to convince the machinery buyers that any machined surfaces can be better than any hand-finished ones. For many years the fallacy has been accepted without question that the hand work of the highly skilled mechanic is very much better than the best examples of machine work. Sir Joseph Whitworth, one of the old-time mechanics and the most dogmatic engineer of his day, was responsible for much of this superstition. It was he who early in the last century evolved the method of originating flat surfaces by scraping three surface plates together in the manner now so well known. Whitworth's plates were probably flatter than any of the slides of any of the machines in his own or any other plant at that time. But we have advanced somewhat in machine design and construction since the days of Whitworth, Silver & Gay, Lathe & Morse and the other old-time machine tool builders of a hundred years ago. Conditions which may have been true at that time may be anything but true now. I think it was James Watt who wrote to his partner Boulton about as follows:

"The new boring machine is an entire success. It bores a hole so true that the hole does not vary in diameter from end to end more than the thickness of a half-crown piece."

A "half-crown piece" is about the size and thickness of our silver half-dollar. What would a mechanic nowadays think of work which would take a feeler gage the thickness of a half-dollar? About three years ago at Watervliet Arsenal I saw a hole bored 16 in. in diameter by about 70 ft. long in hard gun steel. When inspected that hole was found to be round and true to size within 0.002 in. and to be straight from end to end within 0.010 in. The hole referred to in Watt's letter was the bore of a cast iron pump cylinder possibly 6 to 8 ft. in diameter by 8 to 12 ft. long.

Another Trade Superstition

Somehow, many years ago, the erroneous idea originated that if a bearing is ground (lapped), the abrasive remains charged into the metal and will for all time continue to cut. That fable spread from one mechanic to another and from one generation to the next until now it is generally accepted throughout the trade as true. The sole reason why it is accepted is because most of us are too lazy to investigate. It is easier to accept it than to prove that it is or is not true. Within the past two months I have heard it repeated by a man who formerly was one of the most highly skilled toolmakers in this country and who now is considered one of our greatest machine tool designers. He was warning one of his toolmakers against lapping in a bronze bearing with crocus, "because you will never be able to get the crocus out again."

The writer of the editorial quotes that much scraper work is "digging holes in perfectly good bearing surfaces." He is right. I believe it is perfectly safe to say that there are no scraper hands who are capable of scraping a surface as flat or round as it can be machined. There are a few concerns who appreciate the fact that even a planer can produce practically flat surfaces. These concerns have the best planers, keep them in proper condition and employ only skilled men to run them. In this way they get surfaces which are practically flat and which, but for the ignorance, prejudice and precedents which hold the machinery buyers in slavery, would require no scraping at all. They are compelled by convention to do some scraping but even at that they are ahead of the game by having surfaces which are easier to scrape.

In the East is one concern which has had the courage to put out a number of high-grade machines, the flat bearing surfaces of which are just as they come from the planer. There is absolutely no scraping on their product and I have yet to hear of a single complaint regarding the accuracy of their work. But I believe their planed surfaces could be further improved by lapping them together, for the following reason:

At a certain manufacturing plant there are some machines which, in construction and design, are very similar to small metal planers. That is to say, they have a reciprocating platen which is mounted on a bed provided with V's. These machines are used for ruling the lines on glass diffraction gratings. This work is infinitely more accurate than the work required of any metal planer; the lines on the glass must be straight and equally spaced within approximately 0.000001 in. If they are not, the grating will show a "ghost," *i.e.*, a false image, which means that it is unsalable. These machines have been in almost constant operation for several years and I was informed by the man in charge that the slides do not show any signs of wear. There

are two reasons for this, *i.e.*, their design and the methods used in their construction. Regarding the design; the sliding member is made the same length as the slides on which it moves. This is an element of machine design which should be more often employed. While it does not insure against wear, it insures uniform wear throughout the length of the bearing surfaces.

However, the most important factor in reducing wear is the method of finishing the bearing sufaces. Before describing it I will digress for a moment to give the reader some idea of the rigid conditions under which these machines are operated.

They are in a vault far under ground. The temperature is controlled by means of a very sensitive thermostat connected with a bank of electric lamps. After the work is placed and the machine started the ruling of the lines is automatically carried on to the finish without any supervision whatsoever. If a man goes into the vault and remains but a few minutes, the heat of his body will influence the thermostat which in turn will shut off first one of the lamps, then another and another until either he or the rest of the lamps go out. The machine is driven by a water motor which is supplied with water at a constant head from a tank which is kept always overflowing. This gives an almost uniform drive.

How the Machine Was Built

When the machines were built, the slides were planed and scraped but the final finishing was done by lapping. The upper member was used as an ordinary lap and the operator pushed it back and forth till the ways were finished. The first set of ways when finished were rigidly inspected and found to be out of parallel. The cause was traced to the radiated heat from the operator's body. Correction was then made by the operator, using an iron hook several feet long. With this hook pivoted in a projection on the lap and his body screened behind a non-conducting shield, the work was this time brought to a successful conclusion.

If it is possible to finish such super-accurate ways in this manner there is no reason why ordinary machine ways should not be lapped to a high degree of accuracy, if some one only had the courage and initiative to undertake it. The saving would be considerable and the accuracy greatly enhanced.

Where I am now they build a grinding machine which falls within the "precision" class. The boss scraper is a highly skilled man and he tells me that it takes about 10 hr. to scrape the sliding member to fit the bed. I am satisfied that this work could be better done by lapping, and in less than half the time.

At the Landis Tool Co., Waynesboro, Pa., they use a "rubbing-in" machine. After the scraper hand has put the red "marking" on the work and placed the sliding member, one end of a connecting rod is pivoted to it. The other end of the connecting rod is pivoted to a crank which is driven by a pulley and belt. When the machine is started it causes the sliding member to be rubbed back and forth on the bed, its function being merely to show the bearing. If instead of being used with marking, the rubbing-in machine were employed as a lapping-in machine with a suitable abrasive on the sliding member it would finish the bearing. Further, one man could probably operate several of these machines and each one of them would no doubt be able to turn out more and better work than any scraper-hand and at a fraction of the cost.

In the preceding paragraph I have used the term "suitable abrasive." It is possible that the harder abrasive such as carborundum, alundum, emery, etc., might be too hard for such work; if so, there are other abrasives which have been tested and found to be suitable for similar work.

Machine Work Better and Quicker

One of the largest boring mill manufacturers in this country formerly scraped the spindle journals and bearings of his mills. If my memory serves me right, this operation on a certain size of mill took about 9 hours. They now lap to a bearing direct from the turning and boring. Both the members are cast iron and the abrasive they use is ground Turkey stone with oil. The bearing is 50 per cent better and the time for finishing has been reduced to half an hour. When lapping, one must remember that the cutting efficiency of the abrasive can be readily controlled by modifying the lapping lubricant. Generally speaking, a thin oil such as gasoline or kerosene will cause the abrasive to cut more rapidly than a thicker oil. If a viscous oil or grease be used, the abrasive action of a finely powdered abrasive can be entirely suspended, the film of lubricant being thicker than the distance the abrasive particles project above their seats in the metal members being lapped.

There is, however, no sound reason why the harder abrasives should not be used. One of the large manufacturers of high-grade Corliss engines grinds-in (laps) his Corliss valves with carborundum, which is next hardest to the diamond. He tells me that after many years' experience with this method of fitting his valves, he has yet to see a case where the carborundum has given any trouble or caused the valves or their seats to wear unduly. If the work is properly done, valves thus seated have practically a 100 per cent bearing, which is about 50 per cent better than the best scraped bearing. There is therefore every reason why they should give better and longer service.

If carborundum gives such excellent results when used to lap-in cylindrical bearings, I see no reason why it should give any less desirable results when used to lap flat bearings.

Some months ago I had occasion to require three plane surfaces of cast iron. These were to be as flat as it was possible to make them and for this reason it was decided that they should be lapped together. Great care was taken to plane them true and after this it was decided to have them scraped in order to save time during the lapping operation. An expert scraper was instructed to make them as flat as he could, time being no object. The plates each contained about 325 sq.in. of surface. The scraping time was about 20 hr. for the three. When they were tested on a standard surface plate they were found to be flat, as scraped surfaces go, and to have a good uniform bearing, quite good enough for the start of the lapping operation.

For the information of those who have never lapped a job of this sort I may mention that the procedure is exactly the same as when originating three surface plates by scraping; *i.e.*, No. 1 is lapped with No. 2; then No. 1 with No. 3; then No. 2 with No. 3, the lapping and changing being carried on till any two of the plates tested together will show a bearing all over, not in spots as with a scraped surface.

I am now sorry that I did not keep a photographic record of that lapping job. The scraped plates which

seemed so accurate when tested with a standard scraped surface plate showed up very badly when the lapping abrasive took hold. There were areas which did not show any bearing for several square inches until quite a while after lapping was begun. Besides these areas there were twists and winds which were never suspected till the lapping showed them up in all their crookedness. Owing to certain conditions which the plates had subsequently to fulfill (and partly due to our ignorance) we used a very fine grain of carborundum (60-minute powder). For this reason the lapping took a long time, about two days. But when the plates were finished they were flat. We have since made several sets of these plates lapping them directly after planing, and have finished them in considerably less time than it took to scrape the first set. The lapping operation is done entirely by machine, the operator merely supervising the work. Gasoline and kerosene are used as a lubricant during the lapping operation. When the plates are finally pronounced correct they are thoroughly cleaned off and run together dry. After running thus for a short time there seems to be no further cut left in the abrasive which is supposed to be charged into the plates.

In conclusion permit a few words regarding the comparative accuracy of hand and machine-finished precision plane surfaces.

As an experiment I tested a block of hardened steel which had been hand lapped by an expert. In my kit I have a machine-made optical flat which is accurate to $\frac{1}{10}$ of a light wave length; in other words, it is accurate to approximately 0.000001 inch.

On testing the hand-lapped job it showed nearly half a ten-thousandth out of flat while a number of machine-lapped blocks were within from 0.00001 to 0.000003 in. of being flat.

I do not know whether I have proved my case, but I believe I have advanced some evidence that machine-finished bearings, both flat and cylindrical, can be more accurate and cheaper than hand finished ones. I believe I have also submitted some fairly conclusive proof that there is nothing to fear from abrasive charged into the metal of bearing surfaces. It is now up to the manufacturers of machines to do a little experimenting along these lines to the end that they may be able to reduce their costs, improve their product and be in a position to convince skeptical buyers that machine-finished bearing surfaces are better in every way than hand-finished ones.

Increasing Output by Preventing Tuberculosis

The problem of labor turn-over must always be considered in any plan of efficient production. This is a truism, of course, but how many production engineers have considered labor turn-over as involving not only the worker who leaves his job for another but the worker who leaves his job for a hospital or grave?

The bare statements that no less than 700,000 men and women of working age in this country are afflicted by a preventable and curable disease and more than 92,000 of them die annually from this disease, sound startling. This is the case, and tuberculosis is the disease. Yet the 92,000 or more workers who die from tuberculosis are only 70 per cent of the total death roll from this disease. During the past year 132,000 persons of all ages died from tuberculosis in the United States.

In addition to the million active cases of tuberculosis existing here, it is estimated that there is also at least another million persons who have the disease in a latent or quiescent form. The ever-present danger to this latter group is that at any time over-exercise, unwise living or a slight reduction in their powers of resistance may cause the disease to assume an active and frequently fatal form.

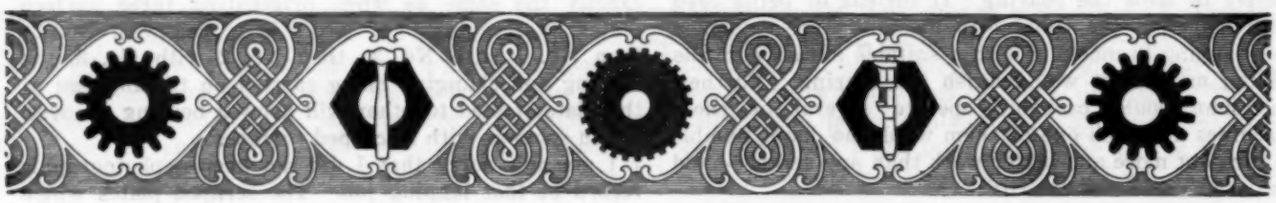
The economic loss due to tuberculosis has been estimated at no less than a half billion dollars annually. Worst of all, it is a loss which can be avoided, since tuberculosis is preventable and curable.

The National Tuberculosis Association which now has 1,200 affiliated organizations in all parts of the country, is carrying on a widespread campaign of education in respect to the nature of tuberculosis and the effective means of combating it. Despite great odds, this is a winning fight, for in the fifteen years since the association began its work the death rate from tuberculosis in the United States has dropped from 200 to 120 for every 100,000 population. Statisticians estimated that in view of the present population this reduction of the death rate means a clear saving of 75,000 lives a year.

One every important phase of the educational work of the association deals with tuberculosis in industry. Here the problem resolves itself into various phases. Prevention of infection is sought by furnishing safeguards against spitting, sneezing and coughing. To build up and maintain the resistance of the individual constant health education of workers and periodic medical examinations are given.

In regard to the return on such an investment in better conditions, the National Tuberculosis Association has estimated that on an average two and one-half years could be added to the average life-time of every individual in the United States if tuberculosis were removed as a cause of death. This would mean a gross saving of at least twenty-five billion dollars to the industries and people of this country. To remove the disease or reduce it to a negligible minimum would cost probably in the neighborhood of two billion dollars.

The purpose of the National Tuberculosis Association and its allied agencies is to unite communities all over the United States in order to secure the machinery and assistance necessary to prevent and control tuberculosis. The Fourteenth Tuberculosis Christmas Seal Sale which will be held in December of this year provides the revenue for this great health and life-saving movement. Every dollar's worth of seals purchased means a blow aimed at this disease.



Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Tools for Forming a Flanged Cover

BY H. SCHMID

On page 403, vol. 55, of *American Machinist*, S. A. McDonald describes a set of tools for forming a flanged cover in three operations following the blank and draw. Here is one that forms a similar cover in *two* operations, *including* the blank and draw. The cover, of 0.025-in. brass, is shown in Fig. 1, and in Fig. 2 may be seen in outline sketch the tools that complete it. As the blank and draw are accomplished by standard tools differing in no respect from thousands of others, the preliminary operation will not be considered. Referring to Fig. 2: *A* represents the cover as it comes from the first operation, in place in the forming tools at the beginning of the press stroke. The recess in the upper die *B* is made to conform to the shape of the upper half of the flange, while the remainder of the shape of the cover is in the lower die *C*. The block *D* fits the inside of the blank. All of these pieces are, of course, made of tool steel and hardened.

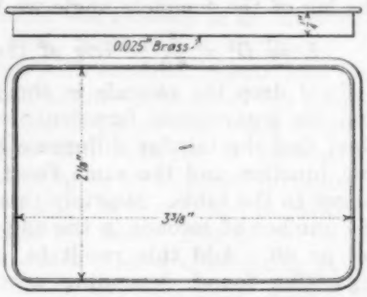


FIG. 1. THE COVER, BLANKED AND FIRST DRAWN

The plate *E* is also of tool steel and acts against studs *F* (of which there are several) to strip the finished cover.

A rubber bumper of the usual form encircles the stud *G* and acts against a plate (not shown) to lift the block

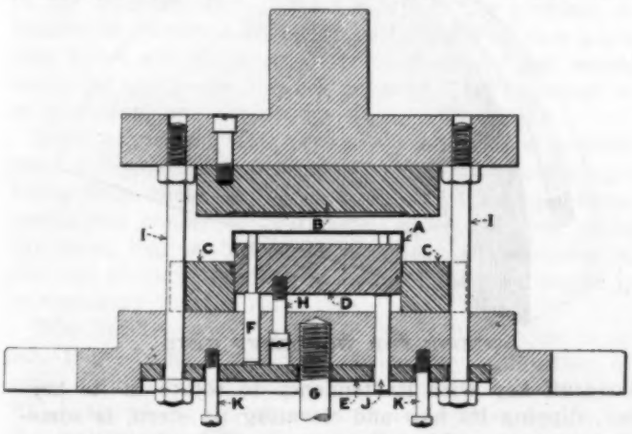


FIG. 2. TOOLS FOR COMPLETING THE COVER

D as far as the limiting screws *H* will allow, at which time the bumper plate abuts against the under side of the die shoe. As the press gate nears the end of its upward movement, nuts on the draw-rods *I*, attached to the upper tools, strike the plate *E* and carry it further into the recess in the under side of the die shoe, stripping the cover through the rods *F*.

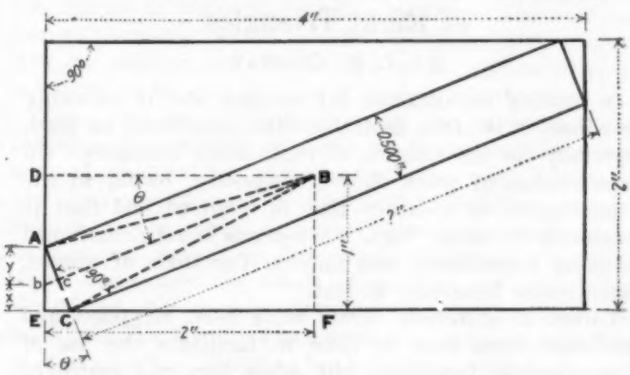
The rods *J* bear upon the lower bumper plate and thus the block *D* follows the upper die *B* with the cover clamped between them until the bumper plate reaches the upper limit of its movement, after which rods *I*, plate *E* and studs *F* strip the cover. Screws *K* have no function other than to hold the plate *E* in place when the tools are out of the press.

In following the action of these tools it will be plainly seen that when the pressure comes on the cover there is no place for the metal to go but into the formed recesses of the dies.

Calculating the Size of a Gage Plug by Triangulation—Discussion

BY HENRY R. BOWMAN

This article gives a solution to A. D. Hallet's problem on page 31 of the *American Machinist*. The problem is to find the length of a gage 0.5 in. wide which will



LAYOUT TO DETERMINE LENGTH OF GAGE

exactly fit in a rectangular hole 2 in. wide and 4 in. long.

The most practical method would probably be to set up four Johannson gage blocks at exact right-angles and the required distance apart, and grind the test gage carefully until it fits in properly.

The mathematical solution illustrated in the accompanying figure, requires the finding of the altitude of an isoscoles triangle *ABC*, where the apex *B* is the intersection of the diagonals of the gage and the side of the hole. The base *AC* equals 0.5 in., and the points *A* and *C* are touching the lines *DE* and *EF*, respectively.

It is impossible to construct the diagram, except by trial, as there are two variable factors, the angle Θ and the altitude *Cc*. It is evident that the calculation must be performed by trial also.

On a piece of tracing cloth draw a line 0.5 in. long, bisect it, and erect a perpendicular line of indefinite length. Lay out on a separate sheet a rectangle 1 x 2 in. Adjust the tracing until the lines are in the proper

position, as shown. Measure the angle θ with a protractor and it will be found to be about 22 deg.

The altitude Bc equals Bb-cb.

$$Bb = \frac{2}{\cos \theta}$$

$$bc = 0.25 \tan \theta$$

But the side $(x + y)$ divided by cos θ must equal 0.5, showing that the angle θ must be decreased. Therefore, a number angles must be tried until one is found which gives the required result.

Let $\theta = 21° 56' 36''$;

$$\text{Then } x = 1-(2 \tan \theta); \quad y = \frac{0.25}{\cos \theta}$$

$\frac{x + y}{\cos \theta} = 0.499992 +$, which is accurate enough for gage work.

$$bc = 0.25 \tan \theta = 0.100719 +$$

$$Bb = \frac{2}{\cos \theta} = 2.15620891 +$$

2 (Bb-Bc) + 2 x 2.055489 = 4.11098, which is the required length of the gage.

[Editors Note: A solution by C. E. Pearce to Mr. Hallet's problem appeared on page 400 of the *American Machinist*. Mr. Bowman's solution has been selected for publication out of a number of contributions, since it gives a very practical method, without the sustained calculation and the use of a biquadratic equation, such as in Mr. Pearce's and in most of the other solutions submitted.]

Logarithmic Formulas for the Solution of Right Triangles

BY J. B. CONWAY

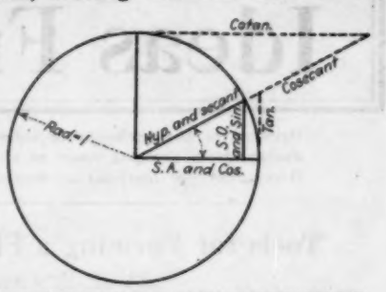
In making calculations for designs and in checking drawings, it is often desirable that logarithms be used, especially for the solution of right-angle triangles. On some classes of work this is necessary, owing to the great degree of accuracy that is required and that is obtainable by using "logs." When one is not accustomed to using logarithmic and natural functions of angles, considerable time may be lost.

Tables of different forms have been compiled and published from time to time to facilitate the use of trigonometric functions, but when logs are employed these rules must be converted into the terms of logarithmic functions before they can be used. It is to afford a ready guide for the solution of such problems that the following formulas have been prepared. The functions of the angle being given in terms of logs, it is necessary only to solve the equations as they stand.

Log S.O. = Log Hyp. + Log Sin A.
Log S.O. = Log S.A. + Log Tan A.
Log S.A. = Log Hyp. + Log Cos A.
Log S.A. = Log S.O. + Log Cot A.
Log Sin A = Log S.O. — Log Hyp.
Log Hyp. = Log S.O. — Log Sin A.
Log Cos A = Log S.A. — Log Hyp.
Log Hyp. = Log S.A. — Log Cos A.
Log Tan A = Log S.O. — Log S.A.
Log Cot A = Log S.A. + Log S.O.
Log Sec A = — Log Cos A.
Log Cosec A = — Log Sin A.

The diagram is self explanatory and is given for reference only. The abbreviations, S.A., S.O., and Hyp., are for side adjacent, side opposite, and hypothenuse.

In using logarithmic tables which give only the logs of degrees and minutes, leaving the odd seconds to be found by interpolation, the following formula will be found helpful in this respect, as very few log tables go into detail relative to this operation. First, let the difference between the log of the smaller and the next larger angle be denoted by D, which is given in most tables as the "tabular difference." Then let the odd seconds in the given angle be represented by s. To find the log of the complete angle we have,



FUNCTIONS OF A RIGHT-TRIANGLE

$$L = D \times \frac{s}{60} \pm \text{Log of the original angle.}$$

First drop the seconds in the given angle, and then find the logarithmic function of the remaining angle. Next find the tabular difference between this logarithmic function and the same function of the angle next larger in the table. Multiply this tabular difference by the number of seconds in the angle and divide the product by 60. Add this result to, or deduct it from the logarithm found, depending upon whether or not the logarithm to be determined is that of a function or co-function of the angle.

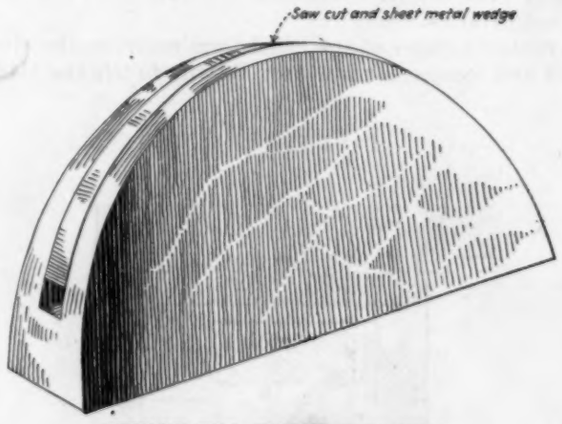
In finding the angle whose logarithm is given, when this angle has odd seconds, the same formula holds, with the exception that s and 60 are inverted in the equation.

Holding a Woodruff Key

BY W. S. ROWELL

The accompanying sketch shows a good method of overcoming that very exasperating condition—a loose Woodruff key.

Any loose key may be seriously at fault, but the



WEDGE FOR WOODRUFF KEYS

Woodruff key with its tendency to rotate in its keyway, dipping its bow and elevating its stern, is somewhat more provoking than its parallel relative.

The usual method of calking loose keys tightens them at the edge of the keyway only, but by splitting the key and wedging as shown—removing any excess of expansion with a fine file—gives a practically parallel enlargement of the key, making it tight to the bottom of the keyway.

EDITORIALS

Eliminating Hand Work

THE past decade has seen the elimination of much hand work in all sorts of machine building. Motor bearings, for example, which were formerly scraped and fitted by hand in all high-grade shops, are now finished by careful reaming with better and more uniform results. There are still a few exceptions but the great majority of high-grade motor manufacturers no longer fit bearings by hand.

This elimination of hand work seems to be more extensive in cylindrical work than on flat surfaces. A few machine-tool builders with excellent reputations for the quality of their product, have abandoned the scraping of such sliding surfaces as planer ways and similar parts, but most builders still consider it necessary. Careful attention to clamping so as to avoid springing, to seasoning to prevent change in shape, and in planing to insure accurate results, will make most of the hand work unnecessary. It is not a case of eliminating skill, but of replacing the skill of hand scraping, which is often laborious, by skillful planing.

Grinding is also a possibility in this direction which will doubtless be greatly developed in the future. But, whatever the means, there can be no question as to the necessity of finding a satisfactory substitute for hand scraping in many places.

But no matter how much of the laborious hand work we eliminate, somewhere along the line we shall need all the human skill possible. We shall not do away with the highly skilled artisan—only relieve him of much that is now laborious and make him more productive in other ways which require even more ability.

The Compensation of Approval

THERE are still many who profess to believe that a fat pay envelope is the only thing which appeals to the worker. But those who study the problem of industrial management with a broad point of view know that there are other important factors. High wages alone do not make for contentment, for harmony or co-operation, and not always for a large output.

Good pay is a prime requisite, not only to contentment but to general prosperity. For with just a bare living wage there can be no buying of the little refinements and household appliances, which not only make life more livable, but make many industries possible. Nor can there be any laying aside of the fund which is so necessary for the rainy day.

Whether the workers themselves fully realize it or not, there is an underlying desire for recognition of some sort, for approval of good work, for something which shows beyond question that they are a part of the institution. The idea of being only a number on the payroll does not appeal. They want to feel that they and their work are necessary to the turning out of the finished product.

They have no use for flattery or fulsome praise, and are quick to discover insincerity of any kind, but they appreciate consideration and fairness, and show this appreciation in many ways. They like to be consulted about changes which affect them rather than to have new rules posted without notice and with no reason given. Plants with means for communication between the men and the management, whether by committees, by works councils or otherwise, are almost unanimous as to the improved feelings which result.

This is a particularly good time to give this matter careful consideration and to lay the foundation for better understanding when business comes back in full force. When one shop can increase its output over one hundred per cent per man at a time when most shops were complaining of a falling off in production, there must be something in the difference in management. And this was accomplished without any incentive of piece work or bonus, but on straight day work, which many declare to be inefficient in every way. No manager who cannot point to a similar record can afford to be contented with his methods of securing production.

Standardizing German Industry

NEVER has the question of standardization been brought home to us with greater force than by Dr. Agnew in his report on the industrial standardization of Germany, which appears elsewhere in this issue. And no matter how we feel as to its advisability, it behooves us to give it careful study and attention.

There can be no question as to the advisability of reducing the number of parts to be carried in stock, and of eliminating unnecessary sizes and kinds of machines and fittings. Capacities of machines, sizes of motors, motor bases, etc., can well be standardized to the general benefit of the whole industry. Practices which are simply the result of accident or of tradition should be eliminated. Lowered unit costs might be made possible by mass production of larger quantities of many parts. This has been the case with bolts and screws for example, these being formerly made by each machine builder and to his own standard.

Standardization should be studied from all angles. There are many things which can be standardized to advantage, sometimes in a single plant, occasionally in an industry. Private and selfish reasons must not stand in the way of reducing costs in the use of machines and machine parts, even if it means wiping out some of our existing practices. But let us be sure that the proposed standards are really improvements and not mere changes to conform with some finely worked out theory.

Whether or not we decide to follow Germany in its wholesale standardization, we should keep thoroughly informed as to what is being done there and in other countries. We should also aid in the work of the American Engineering Standards Committee to secure desirable standards and to prevent the formulation and adoption of others which do not seem to be practicable. In any case we should bear in mind the effect on the industry, or the country as a whole, and not on the particular individual who may be affected adversely.

Shop Equipment News

Gray "Maximum Service" Planer

There are many features of design and construction worthy of note in the planer now being placed on the market by the G. A. Gray Co., Cincinnati, Ohio. Of particular note is the feature of centralized control.

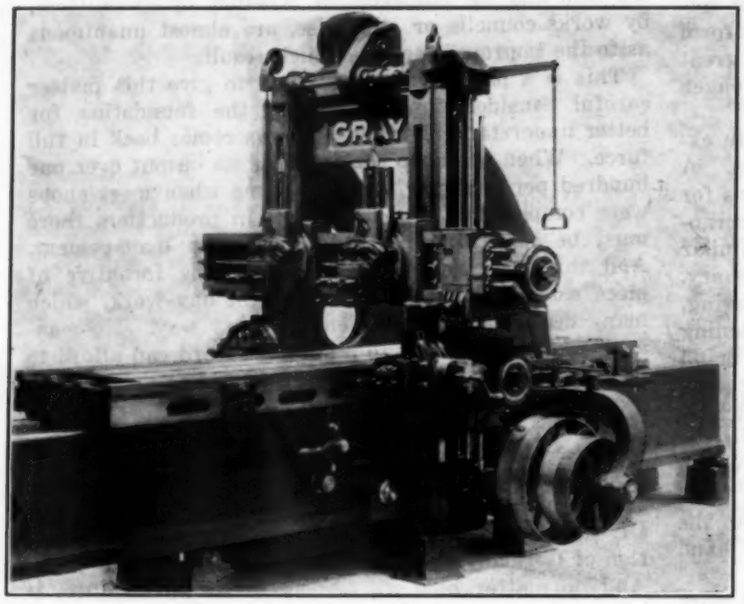


FIG. 1. GRAY "MAXIMUM SERVICE" PLANER

This can well be appreciated by noting in Fig. 1, the grouping of the controls at the operator's position on the right of the machine.

The feed motion is positive. It is adjusted by turning the knob shown at the operator's end of the cross-rail, until the required feed is indicated on the graduated dial. A partial turn of the wrist gives any feed from 0.01 to 1 in. in steps of 0.01 in. The feed dial is automatically locked as soon as the operator's fingers are removed from the knob. The feed mechanism for the rail heads is mounted on the end of the rail, and that for each side head is mounted on the head itself, being always within convenient reach. Rail-head and side-head feeds are entirely independent, so that one can be changed without affecting the other. Feed changes may be made while the planer is running. The large size of the feed dials, see Fig. 2, makes it easy to set feeds instantly, and to see exactly what the feed is at any time.

The rapid-traverse motion is applied to the side-heads, as well as to the rail heads. To move a head, the operator simply shifts the proper lever located on the end of the rail. Shifting the lever disconnects the feed for that particular head, engages the rapid-traverse mechanism and starts the small traverse motor in the proper direction. Moving the lever back to neutral throws out the rapid-traverse clutch, stops the motor and re-engages the feed. Neither the motor nor any part of the rapid-traverse mechanism is in motion, unless a head is actually being moved.

As the traversing mechanism is entirely separate from the feed mechanism, one head can be rapidly set for the next cut while the other head or heads are still feeding. Throwing in the traverse mechanism automatically disconnects the hand cranks, so that they do not revolve and endanger the workman. The rail head levers are at the end of the rail, and the lever for each side head is on the head itself. Shearing pins safeguard the traverse mechanism in case the rail heads are accidentally jammed together. Safety stops obviate the possibility of lowering the side heads too far.

To elevate the rail, the operator pushes up the stirrup hanging near the end of the rail, and to lower the rail he pulls it down. The stirrup is locked in the neutral position, but a quarter turn of the operator's wrist unlocks it. As this stirrup is suspended from a universal joint, the operator may stand in front of the rail, where he can see the position of the work and tools. The control is said to be so exact that the rail can be set to a line.

The motor that operates the rapid traverse also furnishes the power for the rail setter. One movement engages the elevating mechanism and starts the motor. Bringing the lever to the neutral position disengages the elevating mechanism and stops the motor. Safety stops obviate the possibility of raising the rail too high. Turning a crank on the operator's end of the rail releases or tightens the clamps that lock the rail to the housings. The automatic adjustment insures that the rail is clamped equally rigidly at both

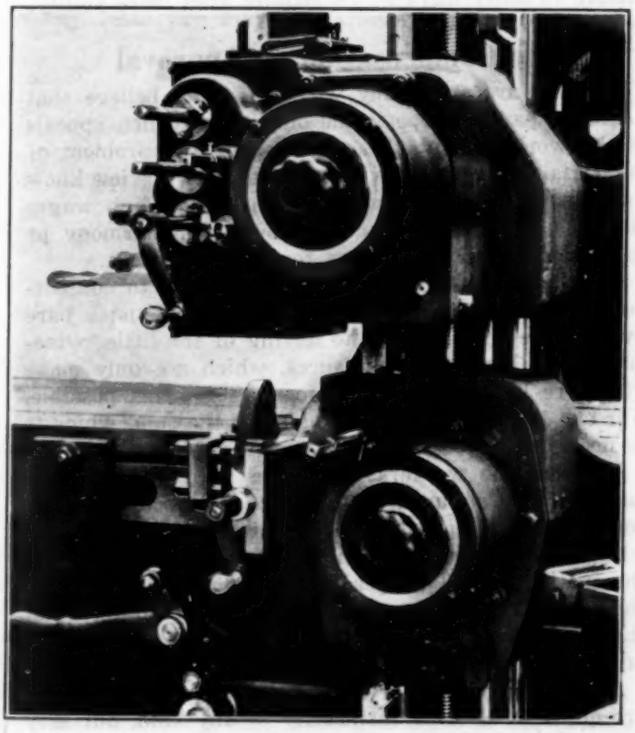


FIG. 2. ARRANGEMENT OF FEED CONTROLS

ends. The rail is locked to the inside of the housings, thus stiffening the rail, as it shortens the length of the rail subject to torsional strain. A moderate pull on the crank is said to clamp the rail more firmly than is possible with outside clamps tightened with a wrench. As the lever operating the rail setter is also on the operator's side of the machine, the planer hand can release the rail, raise or lower it, and reclamp it without moving away from the operating position. This saves time and reduces the idle time of the planer.

The result of these improvements is to bring the control of practically all of the functions of the planer to the operator's usual position. Besides the raising, lowering and clamping of the rail, he can, without moving from his position, set the feed on the rail heads or on the right-hand side head; traverse either rail head or the right side head quickly by power; set the micrometer collars on the rail screws so as to measure accurately the travel of the tool; and, of course, use the tumbler which controls the move-

FIG. 3. POSITION OF OIL PUMP

ment of the table. In doing these things he is in position to watch the tools and so avoid accidents. This is of importance, not merely because it adds to the convenience of the operator, but because the elimination of physical effect makes it possible for the operator to work fast without fatigue, and should result in more accurate work.

The bed of the planer is made full length; that is, the working surface of the table never overhangs, even when taking the maximum stroke. In this way, the table is always rigidly supported, even when run out to the front end of the planer for setting-up work. By eliminating the table overhang, the wear that otherwise takes place at the ends of the bed is obviated. Incidentally, there is no dripping of oil on the floor from overhanging table V's.

The table is of box section, with an interrupted center wall running the entire length and tying the top and bottom plates rigidly together. The usual transverse walls and posts are also provided. All stop-pin holes open into the cored openings of the table, and are easily cleaned from the outside. Chips are removed through the openings in the side of the table.

All of the driving gears run in a bath of oil, so as to minimize wear and prolong their life. An oil pump, shown on the side of the housing in Fig. 3, is direct-connected to the drive shaft, and delivers a flood of oil not only to the V's but also to all of the drive-shaft bearings. The operator's time is thus saved, as he does not have to oil all of these bearings. The pump is of the reversible type, operating on the return as well as on the cutting stroke.

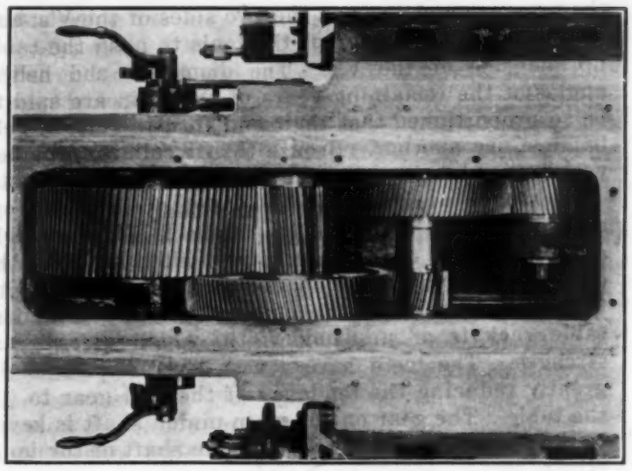


FIG. 4. HELICAL GEARS IN DRIVE ARRANGEMENT

From the pump the oil flows through a filter, the cover plate of which can be seen above the pump, and thence to a hole in each V at the center of the bed. Each table V has a large oil channel, running the full length of the V but closed at the ends. From this channel the smaller supplementary oil groves carry the oil to all parts of the bearing surface. By this means the oil supply is kept constant at all points regardless of the relative position of the table. The filter can be easily removed for cleaning.

The surplus of oil dripping from the table V's and rack flows through a screen into a settling basin at each end of the bed. The settling basin eliminates the fine metal particles entrained in the lubricant and which would otherwise be carried back to the bearings. The oil then flows to the center of the machine through the pump and filter, so that only clarified oil passes to the bearings and V's. The oil pipes are inside the bed, and there are no oil pans, channels or pipes in sight.

To simplify the oiling of other parts, central oil wells have been placed on the rail and side heads. Oil pipes lead from the central well to the different oil holes, so that the operator merely fills this large reservoir instead of many separate oil cups. This not only saves time, but also obviates the danger of overlooking inconspicuous oil holes. From the reservoir the oil is drawn through wicks by capillary attraction, so that only clean oil reaches the bearings.

One of the most important features of the planer is the gearing which drives the table. The involute helical gearing used is said to produce a drive of unusual smoothness, durability and power. All the gears are helical, the arrangement being show in Fig. 4. Helical gears are stronger than spur gears of the same pitch and width of face. They also give continuous pitch-line rolling, since there is always some point on the pitch circle where the mating teeth are in contact.

Advantage is taken of the fact that helical gears produce end thrusts, by arranging the rack so that the end thrust of the bull gear (which amounts to about one-tenth of the driving force) opposes and compensates for the side thrust of the cutting tools when they are being fed away from the operator's side of the machine, as is the case most of the time. As the tool pressure increases, the balancing thrust of the bull gear and pinion increases in proportion, for more power is required to drive the table. This equalizes

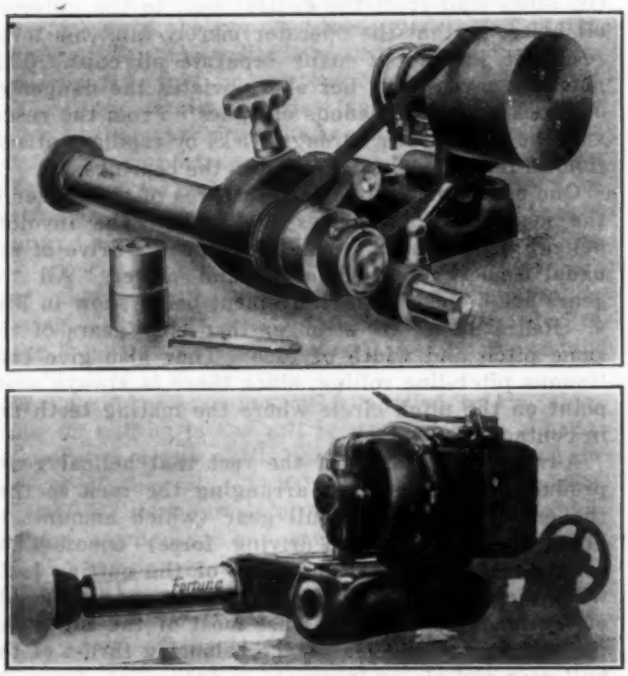
the pressure and wear on the two sides of the V's, and overcomes the tendency of the tools to push the table up the side of the V's. The diameters and helical angles of the remaining gears of the train are said to be so proportioned that their end thrusts very largely balance one another. Bronze thrust collars, provided with forced lubrication, take the resultant end thrusts.

As planer work is usually placed close to the operator's side of the machine, the rack is accordingly placed slightly to the operator's side, so that the driving force will coincide as nearly as possible with the line of action of the cutting tools. The helical table rack is of unusual width, which gives great strength. The teeth have a very low pressure angle, greatly reducing the tendency of the bull gear to lift the table. The gear on the main pinion shaft is keyed to the pinion hub, thus relieving the shaft of torsional strain.

To insure correct tooth action, the teeth are cut by the generating process to true involute form. In order to avoid interference and to obtain smoothness of action and stronger teeth, the pinion teeth are so cut that the greater part of the tooth face lies outside of the pitch circle. The teeth have a low pressure angle, are cut full depth, and have a short arc of approach and long arc or recess, increasing efficiency as well as the number of teeth in contact. This form is said to have the advantage of permitting the use of pinions of large diameter and strong teeth, without the use of stubbed teeth, high pressure-angles and low gear-ratios.

Fortuna Grinding Spindles

The Fortuna internal and face grinding spindles have recently been placed on the American market by the Coats Machine Tool Co., Inc., 110 West 40th St., New York, N. Y. They are intended primarily for shops where no large grinding equipment is installed, but where it is necessary to produce accurately ground holes. The spindle is supported by substantial clamping blocks; short and stocky spindles are used. All attachments are interchangeable and the clamping blocks are built symmetrically, permitting quick reversing of the countershaft or motor, so as to enable the spindle to work to the left as well as to the right. The blocks are equally suitable for mounting on grinding machines and lathes. The spindles are equipped with "Norma" ball bearings throughout, and are made in three types.



FORTUNA BELT AND MOTOR-DRIVEN GRINDING SPINDLES

The Type J spindle is for internal grinding only where no heavy axial thrusts are encountered, the sizes of work handled being from ½-in. hole and 2½-in. depth of 2⅛-in. hole and a depth of approximately 20 in. Because of the simple bearing design, the spindle may be run up to 80,000 r.p.m., it is stated. It should work preferably in a horizontal position.

The Type D spindle is for both internal and face grinding. In addition to the annular ball bearings, the spindle is equipped with one axial thrust ball bearing, and may therefore be used for face grinding, employing a cup wheel. This type should also preferably be used in a horizontal position. If it is intended to use spindles of type J or D in a vertical or inclined position, they can be furnished with a special lubricating device. However, with the exception of the small spindles, type DD spindles are recommended for such purposes.

The Type DD spindle is for vertical internal anl face grinding. The spindle is equipped with double thrust ball bearings, and can therefore stand the heavier axial thrusts in each direction. They are, therefore, not only suitable for internal or face grinding, but also for grinding internal radial grooves. They may be used in any desired position. The minimum diameter to be ground with types D and DD is 1⅞ in. with a maximum depth of 9¾ in., and a minimum diameter of 4½ in. and a maximum depth 36 in.

With the aid of abrasive pencils, holes as small as $\frac{5}{16}$ in. in diameter may be ground to a maximum depth of $\frac{13}{16}$ in., or $\frac{7}{16}$ in. with a maximum depth of 1⅜ in. The clamping blocks for holding the spindles are furnished either with closed or hinged bearings, for belt drive or with a built-in motor for either direct or alternating current up to 250 volts.

At the top of the illustration is shown a belt-driven clamping block of the hinged stype, holding a type D internal and face grinding spindle. At the bottom is a rear view of a type D internal and face grinding spindle, with a cup wheel held in a type A clamping block driven by a d.c. motor, and mounted on a lathe for face grinding.

Dusenbury Duplex Planer Tool No. 2

On page 969, Vol. 54 of the *American Machinist*, the Dusenbury duplex planing tool made by the Waltham Machine Works, Waltham, Mass., was described. The company has now placed on the market the No. 2 size of the tool, the toolbits being ½ x ¾ in. in size.

The tool consists of a cage mounted on a shank and carrying two cutting tools in such a manner that a cutting stroke can be made in either direction. This feature is especially adaptable to use on planers, so that a cut may be taken with both the forward and the reverse movements of the table. Each tool is held in a suitable clapper box, so that clearance is obtained for one tool while the other is cutting.

Pratt & Whitney Full-Automatic Engine Lathe

An engine lathe that is completely automatic in its movements—introducing and gripping the work, turning one or more shoulders to predetermined length and

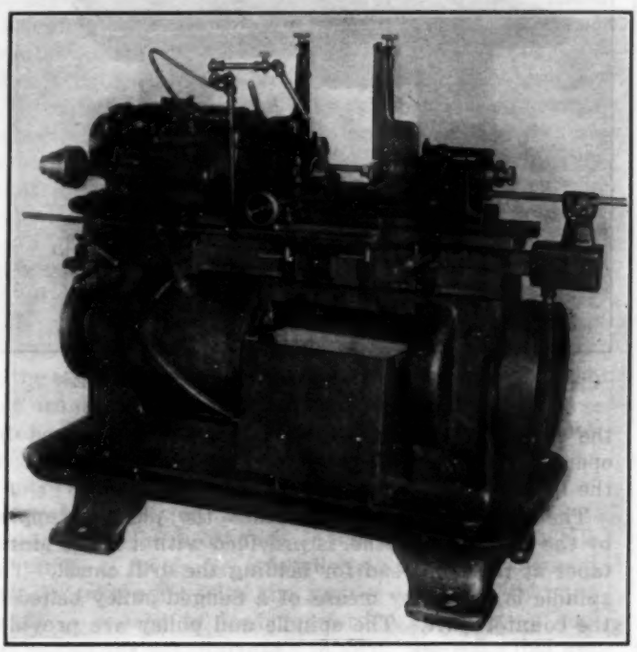


FIG. 1. FRONT VIEW OF LARGE P & W GEARED-HEAD LATHE

Specifications: Length of work accommodated; maximum, 15 in.; minimum, 3½ in. Diameter; maximum, 1¾ in.; minimum, ¾ in. Maximum traverse of carriage, 12 in. Floor space, 6 ft. 7 in. x 2 ft. 7 in. Height, 4 ft. 8 in. Weight, 2,750 lb. Horsepower required, 2.

ejecting the finished piece, thus rendering it independent of its operator—has been placed on the market by the Pratt & Whitney Co., Hartford, Conn.

The machine is intended to handle cut lengths of bar stock or small forgings that must be turned upon centers. The operator is concerned only with maintaining a supply of work in the magazine, and in inspection of the product to see that the cutting tools are functioning properly. One operator may, therefore, run a battery of machines, the number depending somewhat upon the length of the cut and the amount of stock to be removed.

The machine has all the features of an engine lathe: a pair of centers upon which the work is supported while being turned; a loose driver for rotating the work; a carriage with a cross-slide; and a toolpost in which may be held a forged tool or any of the commercial holders for toolbits of high-speed steel. Instead of a lead screw or feed rod, however, the traverse movement of the carriage, as well as all other of the automatic movements, is actuated by drum and face cams carried on a shaft that extends longitudinally through the bed of the machine. Strips bolted to the surface of the drum and adjustable dogs on the face cam constitute the actual cam surfaces that cause the movements, and these dogs may be changed or adjusted to suit the work in hand.

The front shear is made much wider in proportion than is usual on the standard engine lathe, and the carriage is mounted entirely upon it. This leaves the space between the shears unobstructed, so that pieces of work upon being released by the centers may drop through the bed into a removable pan provided to receive them. A swiveling bar mounted on brackets in front of the carriage carries a slide that connects with the cross-slide, and enables the lathe to turn any taper up to 6 deg. included angle; while by substituting a suitably shaped "former" bar, irregular forms may be turned.

The machine is made in two sizes, and with cone or geared head, as desired. In Fig. 1 may be seen the larger size of machine with geared head, while Fig. 2 shows the smaller one fitted with a four-step cone for direct belt drive. Provision is made on the larger machine to bolt a suitable motor directly to the back of the bed when an individual drive is wanted.

In action, the work is fed into the machine from a magazine supported by brackets rigidly attached to the rear of the bed. The magazine is composed of two grooved uprights adjustable to and from each other to accommodate different lengths of work, the grooves being adjustable as to width to suit different diameters. The lowest piece of work in the magazine rests upon the work carrier, where it is held by two fingers. These fingers are adjustable to suit different diameters of work, and are so supported by springs that they will yield slightly when the work is being placed upon the centers in order to adapt themselves to slight variations of diameter, to the small irregularities to be expected in forgings, or to "out-of-roundness" due to careless centering.

At the proper point in the cycle of movements the carrier moves forward, bringing the piece held in the fingers into alignment with the centers. The tail center then moves up, pushing the work through the jaws of the driver and into contact with the live center. The carrier then moves back, allowing the next piece in the magazine to drop into the fingers, the driver grips the work, and the carriage moves the tool up to the cutting

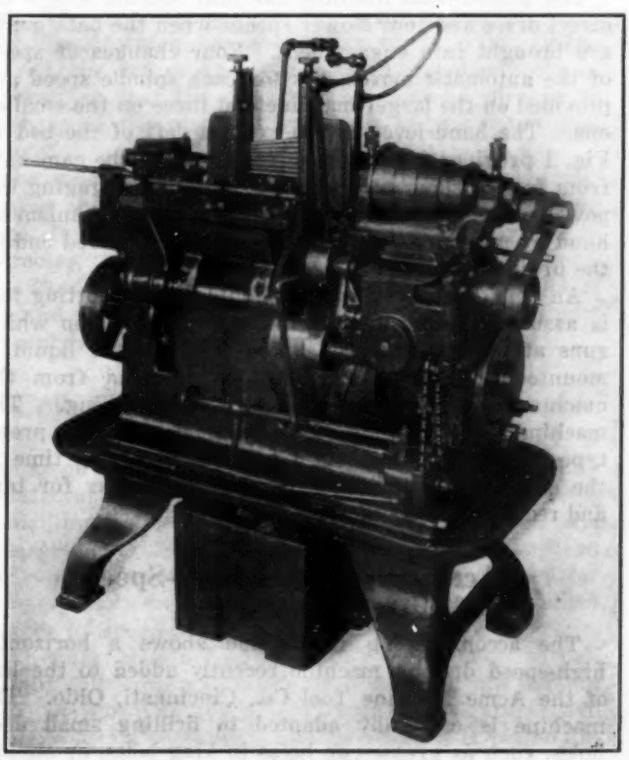


FIG. 2. REAR VIEW OF SMALL LATHE WITH CONE HEAD

Specifications: Length of work accommodated; maximum, 11 in.; minimum, 2½ in. Diameter of work: maximum, ¾ in.; minimum, ¼ in. Maximum traverse of carriage, 8 in. Floor space, 5 ft. 3 in. x 2 ft. 1 in. Height, 4 ft. 8 in. Weight, 1,625 lb. Horsepower required, 1½.

position. The drum shaft has two speeds; and all the foregoing movements are performed at the high speed, thus reducing the waste time. The adjustable dogs on the face cam enable the operator to time these movements to suit the work.

The driver is made in the form of a special chuck with three cam-shaped jaws that are opened by a friction ring operated from the camshaft, and that are closed by the force of coil springs in tension. The shape of the jaws is such that the greater the resistance caused by the cut, the harder will the jaws bite; and, though the ends of the jaws are hardened, they are polished so that they will leave no impression on the work. The body of the chuck is so mounted on the spindle nose as to float laterally, and thus the pressure of the driver upon the work is equalized and no side strain is imposed.

Provision is made for slight variations in the length of the pieces by a slip-ring device in the mechanism that moves up the tail center, so that the endwise pressure upon the centers is always the same despite small discrepancies in this respect. There is also a friction joint in the levers that operate the work carrier, so that if a piece of work becomes displaced and interferes with the free movement of the parts, the machine will cease to function before any part is broken.

The tool being advanced to cutting position, the speed of the camshaft changes from fast to slow and the turning operation is carried forward to completion. Then the spindle is again changed to the fast movement, opening the driver, withdrawing the tail center to allow the work to drop out, and moving the carriage to the extreme right of its travel. At this point the carrier brings the next piece to place between the centers, the carriage moves to the cutting position, the speed of the camshaft changes to slow, and the cycle is repeated.

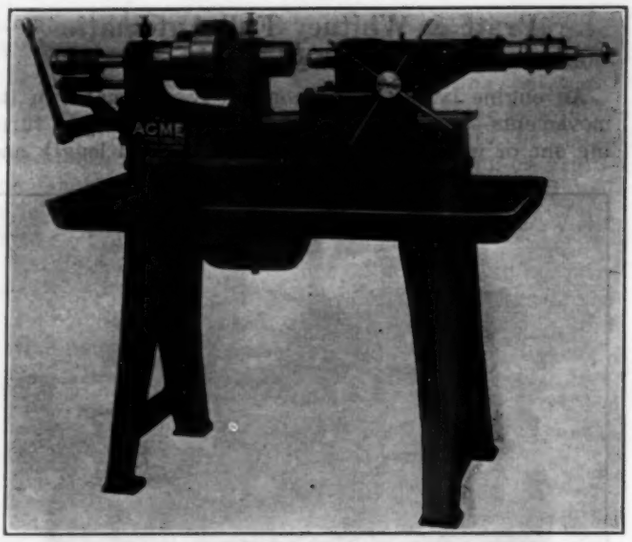
The geared-head machine has four spindle speeds on direct drive and four slower speeds when the back gears are brought into engagement. Four changes of speed of the automatic movements for each spindle speed are provided on the larger machine and three on the smaller one. The hand lever at the extreme left of the bed in Fig. 1 provides for changing the speed of the camshaft from fast to slow, or *vice versa*, or for disengaging the power movement entirely and turning the mechanism by hand by means of a crank handle on the squared end of the projecting wormshaft.

An ample supply of cooling liquid for the cutting tool is assured at all times by a chain-driven pump which runs at a constant speed. The tank for the liquid is mounted on rollers, and may be removed from the machine to facilitate washing and refilling. The machine is not considered an experiment, as its prototypes have been in constant service for a long time in the shops of its builders, turning the blanks for taps and reamers.

Acme Horizontal High-Speed Drilling Machine

The accompanying illustration shows a horizontal high-speed drilling machine recently added to the line of the Acme Machine Tool Co., Cincinnati, Ohio. The machine is especially adapted to drilling small deep holes, such as grease-cup holes in king bolts, or similar work requiring high-speed drilling.

The design of the machine in general is similar to that of a hand-screw machine, the work spindle and the chuck operation being identical. The work is held in the automatic chuck, which is opened and closed by operating the lever located at the front head end of the bed.



ACME HORIZONTAL DRILLING MACHINE

The drill spindle, which takes the place occuppied by the turret of a lathe, is provided with a No. 1 Morse taper at the front end for holding the drill chuck. The spindle is driven by means of a flanged pulley belted to the countershaft. The spindle and pulley are provided with ball bearings. The ball bearings for the pulley are mounted on a separate stationary sleeve, through which the spindle passes, thereby relieving the spindle from belt pull and allowing it to be operated easily and quickly. The spindle is mounted in a separate sleeve having rack teeth into which mesh the gear on the pilot wheel shaft. The pilot wheel serves to move the spindle backward and forward, and the collar on the end of the spindle acts as a stop gage when the drill has reached the desired depth.

The spindle is held in a casting adjustably mounted on the sliding saddle, the arrangement permitting locating for long or short pieces. The spindle is ordinarily run at approximately 3,000 r.p.m. This speed, together with the work-spindle speed of 500, gives a combined drilling speed of 3,500 revolutions per minute.

"Triplex" Bench-Type Combination Machine

A bench machine which combines the functions of the lathe, milling machine and drill press has recently been placed on the market by the Triplex Machine Tool Corporation, 18 East Forty-first Street, New York, N. Y. The machine, a general view of which is shown in Fig. 1, is motor-driven and hand-fed throughout, with the exception of the feed when screw cutting. One of its principal features is the fact that the head can be so shifted on its supporting arm that it may operate at any angle. The spindle can also be fed out a distance of 3 in. by means of a pilot wheel, especially for use in milling and lathe work, and can be locked in position.

The spindle is driven by means of a ¼-hp., reversible ball-bearing motor running at a speed of 1,750 r.p.m. Six speeds are provided for the spindle, the lowest being 90 and the highest 1,150 r.p.m. The change in speed is obtainable by operating the knob shown just above the spindle, so as to shift gears. The motor is belted to the gear shaft, and has a two-speed cone pulley. The spindle

itself is so made as to hold either a faceplate, spring collet or a chuck.

The entire head, including the motor, can be moved up on the circular portion of the frame overhanging the base, so that the spindle occupies any desired angle. The head is counterbalanced by a weight on the inside of the circular column. The machine is shown equipped for lathe work, the spindle being in a horizontal position.

The tailstock is mounted on the end of the base, so as to carry a dead center. It can be removed when desired. A knee or bed mounted on the circular column carries a saddle in which the table of the machine is mounted. The knee can be locked in position on the column, after being raised to the required height by means of a handwheel. A bolt is provided for locking the overhanging end of the base to the tailstock. For the turning of tapers, the knee can be swung slightly on the column and then locked in position by the two locks just mentioned. A handwheel is provided for feeding the saddle longitudinally, and another for feeding the table transversely to the work. The table in this case serves as a toolslide, and carries the toolpost and tool.

When cutting threads on the machine, a master screw mounted on the extension of the spindle at the rear of the machine is used, since no lead screw is provided. The work is held in a chuck or spring collet, and while the spindle is revolving, a handle holding a nut segment is placed in contact with the master screw, so that the spindle is caused to feed forward. The cutting tool remains stationary. At the end of the cut, the nut segment is thrown out automatically by the taper on the handwheel next to the master screw, and the spindle is returned to its starting place by means of the pilot wheel.

The machine is adapted to milling work, the arbor being mounted in the spindle of the machine and supported by the tailstock at the other end. The work can be secured to the table, or in a vise which is provided. End mills can be held in the spindle by means of spring collets, as shown in Fig. 2. When desired to operate the head at an angle, it is lifted on its arm, which is graduated in half degrees, with the divisions spaced $\frac{1}{16}$ in. apart, so that close settings can be made. The head is clamped in position by means of a single nut.

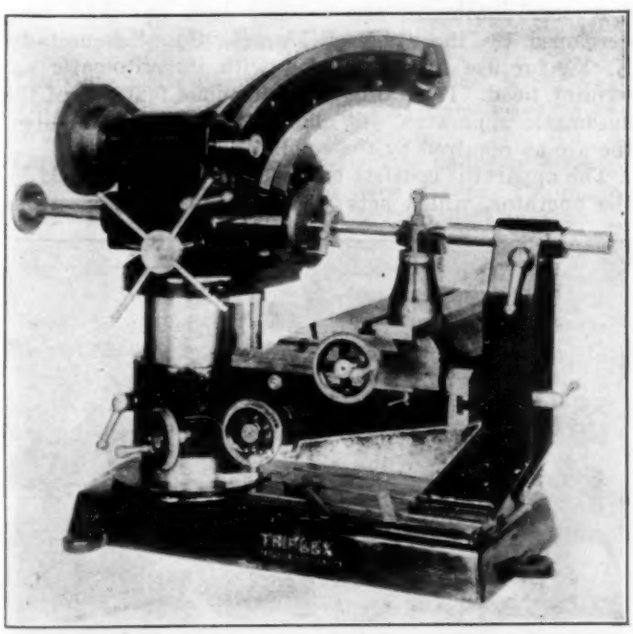
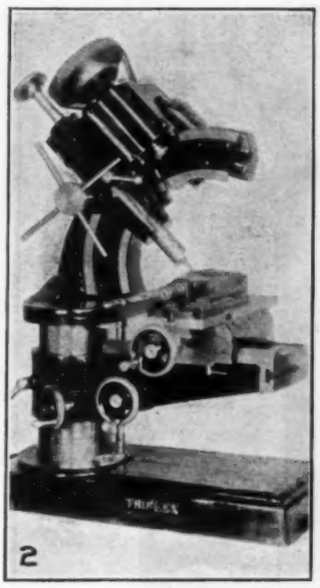


FIG. 1. TRIPLEX COMBINATION MACHINE USED AS A LATHE



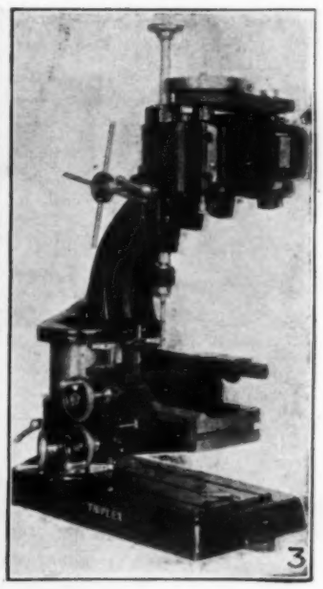


FIG. 2. ANGULAR MILLING. FIG. 3. TRIPLEX MACHINE USED AS A DRILL PRESS

Specifications: Table, 5 x 14½ in. Feed: longitudinal, 10 in.; transverse, 6 in.; vertical, 4½ in. Spindle travel, 3 in. Swing: over table, 8 in.; over ways of bed, 14½ in. Center distance, maximum, 14 in. Diameter of milling arbor, ⅞ in. Spring collet capacity, ½ in. Bench space, 16 x 26 in. Height, maximum when spindle is vertical, 43 in. Weight, 450 lb.

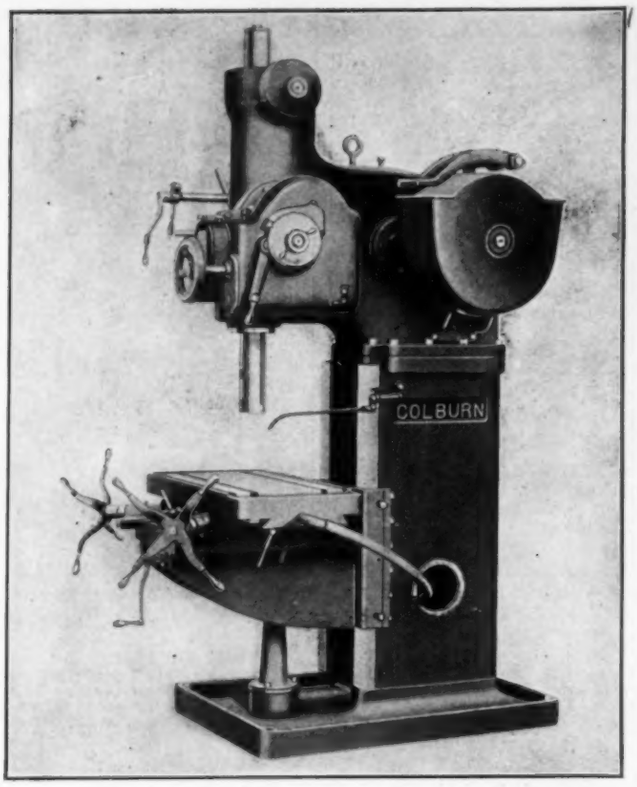
When the spindle is swung to a vertical position, as shown in Fig. 3, the machine can be used as a drill press. This position is suitable also for vertical milling. The machine is furnished with a Jacob's No. 6 drill chuck, which has a capacity up to ½ in. When desired, the bed or knee can be swung entirely out of the way, so that the work can be fastened directly to the base of the machine by means of the three ½-in. T-slots.

The machine is intended to provide a complete machining equipment, although it has a very small floor space. It is stated to be especially adapted for use in toolrooms, on steamships, in experimental shops, laboratories and the like. It is well adapted to use on angular jigs and fixtures, and on small production work requiring angular drilling or milling operations.

Colburn No. 6 Heavy-Duty Drill Press

The Colburn Machine Tool Co., Cleveland, Ohio, is placing on the market a No. 6 size of its heavy-duty manufacturing drill press. The machine is intended for drilling holes up to 3 in. in diameter in steel. Its rated swing is 28 in. The controls are centralized on the front of the machine, so that it is not necessary for the operator to move from his position in order to effect changes of speed and feed.

The machine is driven through a constant-speed belt to tight and loose pulleys mounted on the main driving shaft, as shown in the accompanying illustration. No countershaft is required. All the gearing is placed inside the head casting, which forms an oil-tight box. The driving gears are made from chrome-nickel steel and have stub teeth, while the feed gears are made of high-carbon steel. No clutches are used, the speed changes being effected by sliding the gears. The gears



COLBURN NO. 6 HEAVY-DUTY DRILL PRESS

Specifications: Capacity in steel, 3 in. Swing, 28 in. Maximum distance: spindle to plain table, 36 in.; spindle to compound table, 30 in.; spindle to extended base, 53½ in. Power feed, 18 in. Working surface: plain table, 20 x 24 in.; compound table, 18 x 30 in.; extended base, 24 x 24 in. Vertical adjustment of table, 13 in. Compound table: longitudinal travel, 20 in.; transverse travel, 8 in. Total height, spindle up, 115 in. Floor space: with plain table, 33 x 63½ in.; with compound table, 65 x 71 in. Net weight: with plain table, 4,020 lb.; with compound table, 4,545 lb. Export box, 128 cu.ft.

run in oil. Automatic lubrication by splash is provided for all of the journal bearings, although the vertical bearings are lubricated by means of wicks, which draw the oil by capillary action.

The spindle is of large diameter, and has a No. 5 Morse taper hole. Its driving quill is bronze bushed, and has rack teeth cut directly on its surface. Two quick changes of speed may be made by means of sliding gears operated by a handle. By the use of transposing or change gears, forty-eight different spindle speeds ranging from 30 to 375 r.p.m. can be obtained. Two feeds having an approximate ratio of 3 to 1 are obtainable by means of a slight movement of the worm-feed handwheel. By the use of transposing gears, 36 feeds ranging from 0.005 to 0.134 in. per revolution of the spindle are obtainable. By means of the capstan wheel rapid movement of the spindle may be obtained.

The speed transposing gears are located in a box on the left-hand side of the machine, and are so arranged that they can be quickly changed. The feed transposing gears are located in a box on the front of the spindle head. Because the machine is intended primarily for manufacturing operations, it is not deemed necessary to have a complete range of feeds and speeds operated by a quick-change lever.

The work table is provided with a large oil groove around its edge, and has T-slots for the clamping of work. It can be furnished in either the plain or the compound style, the latter being illustrated. Owing to the long bearings provided, and to the supporting screw, the table is said to be very rigid. The movements of the compound table are controlled by hand by means of the two capstan wheels placed at the front of the machine.

A geared tapping attachment can be furnished, this attachment consisting primarily of a set of friction clutch reversing gears having a reverse ratio of about 1½ to 1. The attachment is driven directly from the driving shaft, and is controlled by means of a lever placed at the front of the machine, so that the direction of motion can be instantly reversed. An automatic tripping mechanism can be set to trip the feed at any desired depth. It is also possible to return the spindle automatically to the top of the stroke after tripping, the spindle being counter-balanced to facilitate this movement. It is stated that safety and interlocking devices are provided on the machine to fully safeguard its operation. The speeds cannot be changed while the machine is running. All gears, pulleys and running shafts are enclosed.

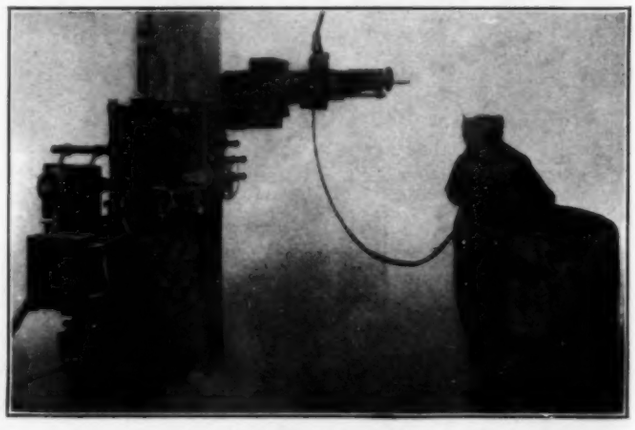
The machine can be provided with an extended base to provide for the accommodation of work requiring considerable height under the spindle. A constant-speed motor of 10 to 20 hp. can be mounted at the rear of the machine on the lower part of the column, being connected by belt to the tight and loose pulleys. The coolant is circulated by means of a pump driven from a small pulley on the main driving shaft. A storage tank is provided in the lower part of the column, while a flexible pipe conveys the coolant from the table to the tank.

The machine can also be furnished in gangs of two, three, or four spindles. In such cases, the same base and table serves for each unit, and the columns are joined. The distance between the spindles is 35 in. Each unit is driven separately by means of a belt, thus making it possible to utilize only the spindles desired. All of the attachments suited to the ordinary type of machine can be supplied on the gang drill.

G. E. Arc Welding Device

A semi-automatic arc welding lead has just been developed by the General Electric Co., Schenectady, N. Y., for use in conjunction with its automatic arc welding head. It retains the continuous features of the automatic apparatus, yet allows the operator to direct the arc as required by the conditions of the work.

The apparatus consists of a welding tool to be held by the operator, which acts as a guide for the electrode



G. E. ARC WELDING DEVICE

wire. In the handle of the tool is a switch for operating the control on the panel of the automatic welder to start and stop the movement of the electrode wire. Attached to the tool is a 10-ft. length of flexible steel tubing, with an adapter on the other end for attaching it to the automatic welding head. The wire passes from the feed rolls of the head into the flexible tubing and thence to the arc through a guide nozzle in the welding tool. The automatic welder functions in its accustomed manner, tending to hold the arc length constant, and the operator merely directs the arc as required by the particular job in hand.

The field of application of the semi-automatic is the welding of products where the seams to be welded are of very irregular contour, or on very large work where the travel mechanism and clamping necessary for the full automatic welder would be complicated and costly. In many cases the edges of the seams are not accurately prepared, making gaps in some places and tight fits in others. The automatic welder with mechanical travel cannot compensate for these conditions by varying the speed, or by manipulation of the electrode, but with the semi-automatic, they are taken care of.

The semi-automatic welder may also be used for building up metal rapidly, as in the case of filling up blow holes in castings, or building up worn spots, etc. The speed of deposition of the metal varies widely, being somewhere between the ordinary hand speed and that of the automatic, according to the conditions of the particular job. In general it is about twice as fast as hand welding.

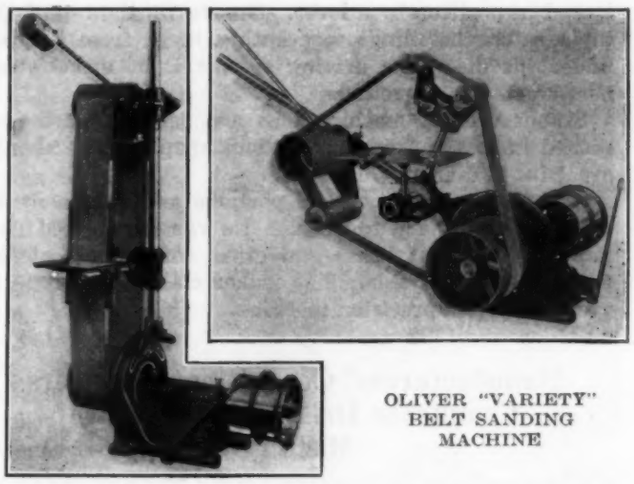
In its use the following advantages are claimed for the device: Saving in time ordinarily lost in changing electrodes; saving of from 10 to 20 per cent in electrode material ordinarily thrown away as waste ends; operators become proficient in the use of the tool very quickly, as they do not require the muscular training necessary for hand work; continuous operation results in few interruptions in the welding, each interruption being a potential source of defective welds.

Oliver No. 127 "Variety" Belt Sanding-Machine

The Oliver Machinery Co., Grand Rapids, Mich., has recently added to its line the belt sanding-machine shown in the accompanying illustration.

The flexibility of the machine will be understood from the two positions in which it is here shown. The main drive pulley is mounted on the countershaft in such a way that the entire frame of the machine may be swung around the center of the countershaft. The supporting arm carries brackets for supporting the main idler pulley and the tension idler. A smaller arm carries the table and backing plate and in place of the latter special or flexible pads may be substituted.

The edging table is 10 x 12 in. and can be tilted either up or down 30 deg. It can be adjusted in or out and has drilled holes for attaching a wood top or special forms. The backing plate is 10 in. wide and can be adjusted in or out to suit the tension on the belt, and has drilled holes for attaching flexible pads. The main idler is adjustable up or down the arm to take care of various lengths of belts. The tension idler is pivoted about the center line of the main idler and is balanced by weights to give the proper tension to the belt. Both the main and tension idlers are leather covered and run



OLIVER "VARIETY" BELT SANDING MACHINE

on ball bearings. The driving pulley is also leather covered and the countershaft runs on roller bearings.

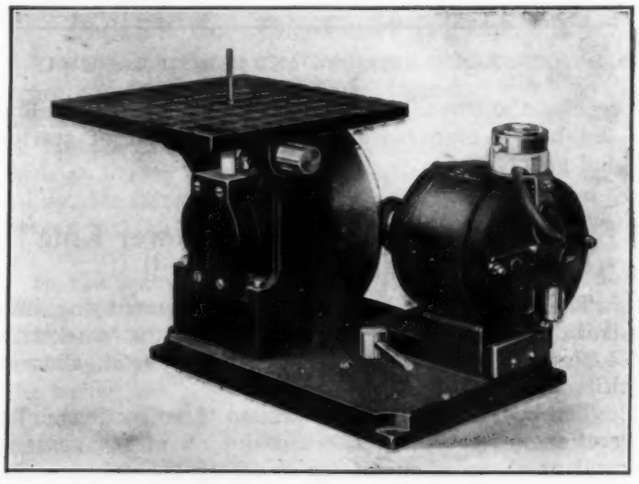
A fork idler to be used in oval sanding, is mounted on the machine in place of the regular table. It is rigid in construction and carries two aluminum idlers, adjustable to the work, running on ball bearings. The sanding belt is 10 in. wide and 14 ft. long. The tight and loose pulleys are 10 in. diameter and 5 in. face and run at 900 r.p.m. The equipment includes edging attachment, fork idler and all necessary wrenches; floor space, 48 x 96 in.; height over all, 80 in. The machine can be furnished with either belt or motor drive. Weight (belt driven), crated, 450 lb.; boxed for export, 650 pounds.

Haskins Die Filing Machine

The die filing machine shown in the accompanying illustration has been brought out by the R. G. Haskins Co., 27 S. Desplaines St., Chicago, Ill.

The machine is motor driven through a friction disk and the motor is mounted on a dovetailed slide in such a way that by sliding it forward or backward, speeds ranging from 300 to 700 strokes per minute can be obtained. Provision is made for stopping the machine without stopping the motor. The motor is ¼ hp. and is provided with ball bearings.

Reciprocating motion is imparted through a hardened and ground steel block and guide, entirely enclosed and having ample provision for lubrication. The table is 9 in. square, adjustable for filing at an angle and is



HASKINS DIE FILING MACHINE

locked in position by a lever. Grooves in the top of the table catch the filings, preventing them from lodging under the die. The driving spindle is of nickel steel, heat-treated and ground.

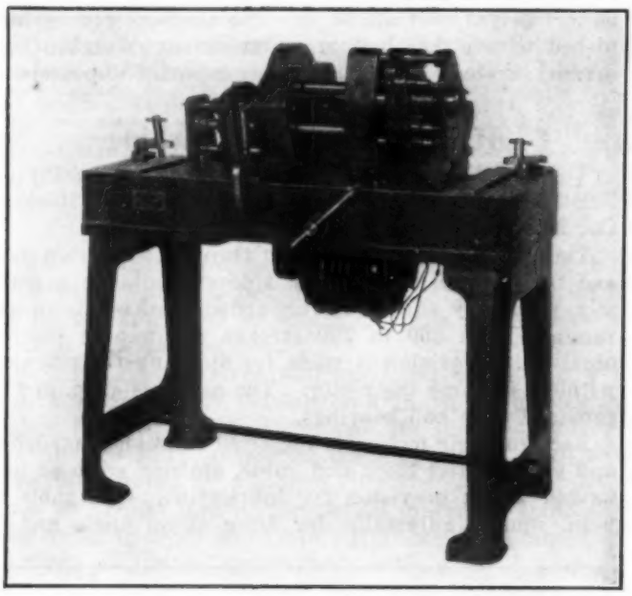
Standard filing-machine files are used and are furnished in sets of twelve in various shapes. The shanks are ¼ in. in diameter.

The machine is light and portable and can easily be carried from bench to bench. Its range of speed permits the filing of brass and other soft metals at the proper cutting speeds. The maker claims that it is in every respect a precision machine.

Manufacturers' Consulting Engineers Crankcase Drilling and Boring Machine

The crankcase drilling and boring machine shown in the accompanying illustration has been recently placed on the market by the Manufacturers' Consulting Engineers, McCarthy Building, Syracuse, N. Y.

The machine is equipped with a driving motor and two movable heads which are fed in opposite directions by a hand lever. Each head carries a number of drills and a boring head, the number depending on the character of the operation to be performed. The machine as illustrated carries three drills and one boring head in each of the movable heads, and is intended for drilling and boring crankcases for the attachment of starters and generators.



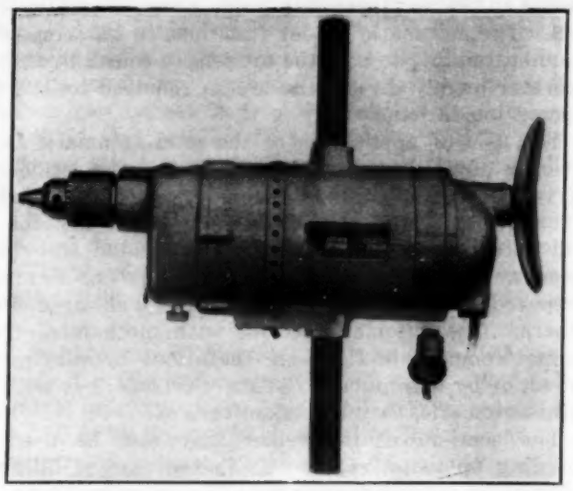
CRANKCASE DRILLING AND BORING MACHINE

Jones, MacNeal & Camp "Power King" Portable Electric Drill

The portable drill shown in the accompanying illustration has recently been placed on the market by Jones, MacNeal & Camp, 533 South Clinton St., Chicago, Ill.

The body of the drill is built in three sections. The section nearest the chuck contains all of the gears as well as the mechanism for changing the speeds. The middle section contains the motor, switch and all the wiring. This section is so designed as to permit examination and repair of all parts without disturbing the motor bearings. The armature or the field need only be removed when replacement is necessary. The rear section is merely a protecting cap and contains no bearings.

The case is aluminum and the breastplate is interchangeable with a handle. A feed screw can be furnished in place of the handle or breastpate so that the drill can be used with a bracket or "old man."



"POWER KING" PORTABLE ELECTRIC DRILL

The motor is universal and can be operated by either alternating or direct current. It was specially designed and built by the General Electric Company for this drill. The spindle, armature shaft and drive shaft run in ball bearings, those for the spindle being of the combination radial and thrust type.

While the speed of the motor is constant, two speeds for the spindle are provided through helical gearing of alloy steel, heat-treated and ground. The gears run in a chamber packed with grease insuring constant lubrication.

Fifteen feet of cord and an attachment plug are furnished with each drill. The drill is made in eight sizes for drilling holes from ⅛ to 1 in., and with spindle speeds of 1,400 to 2,400 and 300 to 375 r.p.m. Motors for either 110 or 220 volts can be furnished.

Hartman Universal Drilling Fixture

The device shown in the illustration is intended for use on a drill press in the toolroom or machine shop, and has been brought out recently by the Hartman Manufacturing Co., 308 Pearl St., Hartford, Conn. It is designed to take the place of the many parallel strips and pieces of blocking that are needed where there is much drilling of irregular shaped pieces to be done, and where the quantity of any one kind does not warrant the expense necessary for the construction of a special fixture or jig.

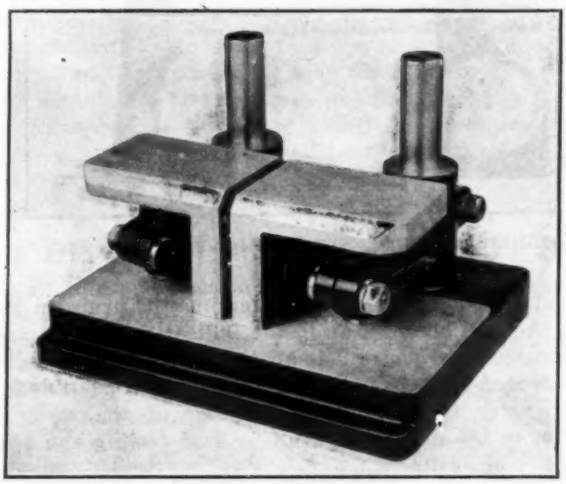
The fixture consists primarily of a base block and two adjustable angle plates that may be placed in any position relative to each other and securely fastened. The base is accurately scraped and, with the angles swung out of the way, may be used as a bench plate for setting up or laying out work. The back edge is machined square with the surface, so that the device may be turned on edge and clamped to a larger angle

plate on the drill press table when desired. A ledge on the front of the base provides for the use of clamps without obstructing the working surface.

One edge of each of the small angles is bevelled to 45 deg., so that when the two edges are placed together a V is formed for holding round pieces. By adjusting the distance between the angles, the V may be made of any size and will provide an opening at the bottom to allow a drill to pass through. Setting the angles out of parallel with each other makes a V capable of holding tapered pieces with the upper surface level or at any desired slant. The opposite edge of each angle is rabbetted, so that by reversing the relative positions a thin piece of flat stock may be held for drilling. A flat piece of any width within the limits of the device and of any shape may be thus held provided it has two straight edges, not necessarily parallel.

By raising one angle block and securing it in position on top of the other an internal angle is provided, while by raising one angle block to a higher level and clamping it in position, two parallel surfaces of any relative height are secured. The clamping device is said to be sufficiently rigid that drilling may be done without appreciable deflection while either of the blocks is raised above the base and unsupported other than by the clamping arm.

All the clamping bolts are pinned to prevent rotation, and all the nuts are of the same size so that but one



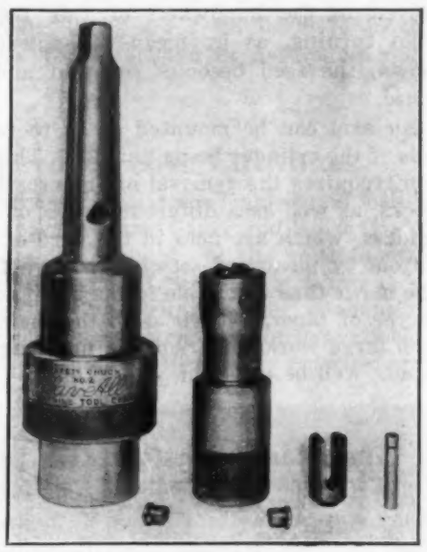
HARTMAN UNIVERSAL DRILLING FIXTURE

wrench is needed. The base, angle blocks, and clamping arms are of cast iron, and the swivel posts and clamping bolts are of heat-treated steel. The base covers a space of 8 by 12 in. and the height of the posts is 7½ in. The weight of the device is approximately 60 pounds.

"SaveAll" Quick-Change Drill Chuck

The quick-change drill chuck shown in the illustration is intended for holding drills with taper shanks. It is known as the "SaveAll," positive, safety, quick-change drill chuck, and is being placed on the market by the SaveAll Tool Co., 59 River St., Waltham, Mass. The chuck has a safety device to prevent breaking and burning of drills, taps, reamers and counterbores. A soft steel pin, which drives the collet, is sheared off when the cutting tool is overloaded. The pin is held in place by a pointed screw positioning in a groove in the pin; and when it has been sheared, it can be removed by loosening the screw and inserting a new pin. Certain sizes of shearing pins are applicable to drills of various diameters, the same pin being used with $\frac{31}{64}$ to $\frac{33}{64}$-in. drills.

The drill or tool is held in the collet, which can be slipped into the chuck when the sleeve on the latter is raised. Lowering the sleeve forces inward jaws which engage the collet on its taper end. At each end of the collet there are bearing surfaces, which enter holes in the chuck, preventing the collet from getting out of line, and giving it a solid bearing. A compensating collet lock for automatically taking up wear and eliminating end motion is provided, as well as a Bristo hollow safety set screw for preventing the tool from pulling out. Collets can be changed while the machine is in motion or at rest.



"SAVEALL" QUICK-CHANGE DRILL CHUCK

In the small end of the collet is an ejector, a light blow on which releases the drill or tool. The capacity of the No. 2 chuck is ¼ to 2-in. taper-shank drills, i.e., Nos. 1, 2, 3 and 4 Morse tapers. In the illustration are shown a chuck, collet, ejector and shearing pin, while in front are the two jaws. The chuck is simple and durable, there being but four working parts and no rolls, keys, drifts or springs. With the exception of the shear pin, all parts are hardened.

By reducing the danger of burning and breaking the drills, the maker claims that an operator is enabled to drill safely at the maximum efficient cutting speed of the tool. It is stated that in a 2-in. screw machine drilling ¾ x 5¼-in. holes in machinery steel at 6½ in. per minute, three to five pins were sheared per 300 holes, which was the production for 8 hours.

Pedrick Portable Taper Boring Bar

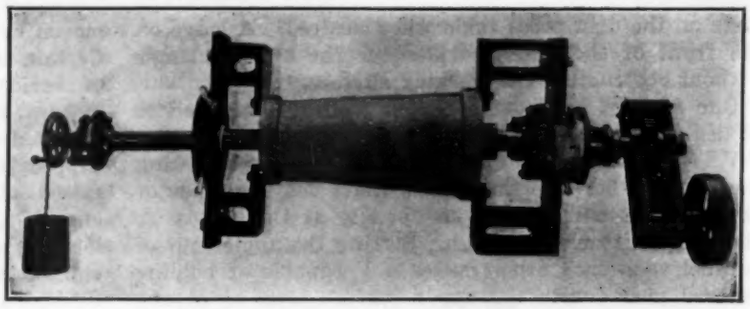
The Pedrick Tool and Machine Co., 3638 North Lawrence St., Philadelphia, Pa., has recently placed on the market a portable boring bar intended for the boring of tapered holes. The tool is adapted to large work, such as boring and re-boring marine propellers. It is adjustable for any degree of taper, and can be used for boring straight holes also. It is not necessary to supply fixtures for different sizes of holes.

In the accompanying illustration, the bar is shown set up for boring the taper hole in a cylindrical casting. The piece being bored serves as a support for the machine, and to it are fastened the crossheads that hold the boring bar. Each crosshead has four setscrews for adjusting and aligning the bar after it has been roughly centered in the hole. The taper is derived from a cross-slide and yoke into which the bar is secured by a gud-

geon pin, the degree of taper being controlled by the distance the slide is moved from its central axis.

The driving gearing is stationary, so that it may be driven by means of a belt, electric motor or portable pneumatic drill in either a vertical or horizontal position. On the opposite end of the bar is the feed case. By preventing the handwheel of this feed case from turning, as by means of a weight as shown, the feed becomes constant and automatic.

An arm can be mounted so as to face the ends of the cylinder being finished. This operation, however, requires the removal of the crossheads and spaceblocks, as well as a different means of holding the bar. Spiders, which are held in the bore at the top and the bottom by means of setscrews, serve for this purpose. The bar is thus adaptable to the boring of holes with any degree of taper, as well as to the facing of the hub on such large work that requires finishing in position and cannot well be placed in a machine.

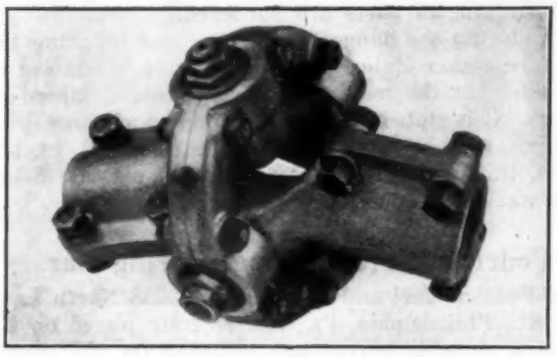


PEDRICK PORTABLE TAPER BORING BAR

American Adjustable Universal Joint

The Hartman Manufacturing Co., 308 Pearl St., Hartford, Conn., has recently place on the market a universal joint intended especially to transmit relatively large powers. The usual ball is replaced by a ring that surrounds the forks and carries the hardened steel studs which have tapered bearings in the fork ends. This ring is in two parts, as shown in the illustration herewith, so that the joint may readily be assembled or disassembled, and adjustments made to compensate for wear. An annular oil chamber within the ring holds a large supply of oil. The sleeves also are split, and may thus be applied to shafts without disturbing the endwise position of the latter.

As the joint is primarily intended for motor-boat service, the castings are of bronze, but may be supplied in



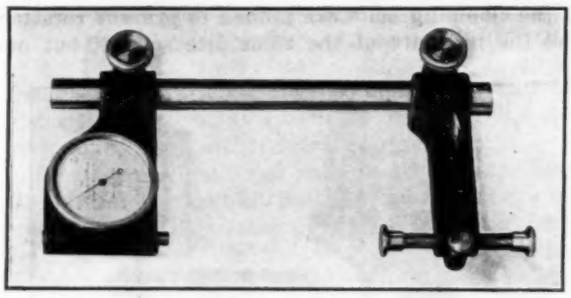
AMERICAN ADJUSTABLE UNIVERSAL JOINT

malleable iron or steel if desired. The joint is made in all commercial sizes for shafts from $\frac{5}{8}$ to 2 in. in diameter.

Horstman Extension-Beam Indicating Caliper

The F. W. Horstmann Co., 196 Coit St., Irvington, N. J., has recently placed on the market the extension-beam indicating caliper shown in the accompanying illustration. The device is similar in principle to that described on page 917, Vol. 50 of the *American Machinist*, its capacity being greater, however. The rear surfaces of the arm are flat, so that by laying the device on a plane surface and tightening the clamping screws, the plunger and adjusting screw can be kept in alignment. The beam is ordinarily 6 in. long and $\frac{1}{2}$ in. in diameter, although any length required can be furnished.

The uses of the device are stated to be varied. On a lathe it may be used for gaging across the face of chucked work of large diameter, and on a planer for

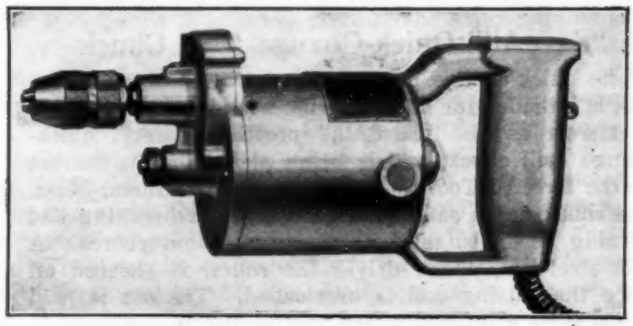


HORSTMAN EXTENSION INDICATING CALIPER

duplicating wide pieces. By reversing the arms on the beam, the tool becomes an inside indicating caliper, and can be used on any size hole above $4\frac{3}{4}$ in. Since the dial is graduated in thousandths of an inch, it is possible for the operator to see directly the size of the work in relation to the desired size, instead of feeling the size, as with plain calipers.

Lovejoy No. 3 Electric Drill

The electric drill shown in the illustration herewith and formerly made by the Ideal Electric Drill Co., is now being made by the Lovejoy Tool Works, 319-331 West Ohio St., Chicago, Ill.



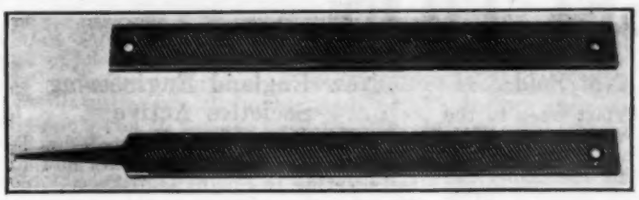
LOVEJOY NO. 3 ELECTRIC DRILL

The drill has a capacity for drilling ¼-in. holes in steel. It weighs only 4 lb. and is furnished with either a 110 or 220-volt motor suitable for direct or alternating current. The switch is conveniently placed and is operated by the thumb. The drill has ample ventilation with provision for oiling, and is driven through a bronze gear.

Steele-Sayward File

The file illustrated herewith has recently been placed on the market by the Steele-Sayward Co., 79 Milk St., Boston, Mass., under the trade name "Hygrade Hand Miller."

While the tool has the appearance of an ordinary mill



STEELE-SAYWARD FILE

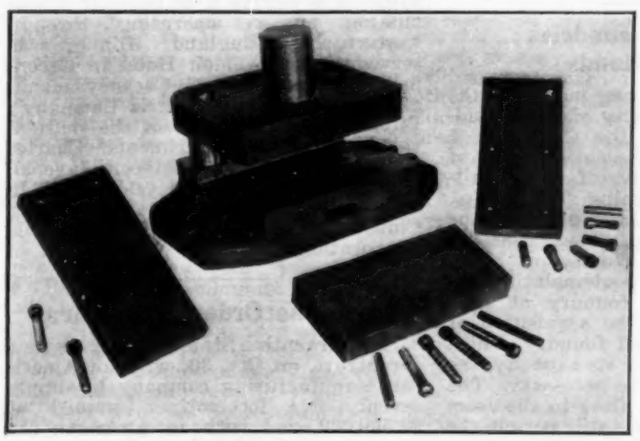
file, the teeth are milled instead of being forced up by the usual process of file cutting.

The following claims for this tool are made by the maker: That the process of forming the teeth does not harm the grain structure of the steel; that the steel is especially heat-treated to give maximum hardness and toughness to the teeth; that the tool works equally well on all metals and alloys; that when used on lead, solder or babbitt the teeth do not become clogged.

Files can be furnished either in the blade type as shown at the top of the half tone, or in the tang type at the bottom.

Diamant Standard Punch and Die Sets

In the construction of metal cutting dies there are certain unit parts which are of the same general design and for the purpose of supplying shops not making



"DIAMANT" STANDARD PUNCH AND DIE SET

punches and dies on a manufacturing basis, the Diamant Tool and Manufacturing Co., 91-97 Runyon St., Newark, N.J., has brought out standard punch and die sets as shown in the illustration.

The sets are made in five sizes capable of a very large number of combinations, so that the purchaser may be able to fill his needs without the inevitable loss of time were he to have patterns and castings made and do the machine work himself.

The die sets are furnished complete in every respect, with the exception of the die openings and the holes for inserting the punches in the punch plate. Screw holes are drilled and countersunk and all screws and dowels required are furnished.

It is claimed that die blanks are of good grade of oil-hardened steel. They are from 0.006 to 0.010 in. oversize to allow for shrinkage in hardening and for final grinding.

Shepard Electric LiftAbout

To provide an electric hoist applicable to all load-moving jobs the Shepard Electric Crane and Hoist Co., Montour Falls, N. Y., has brought out the hoist illustrated herewith under the name of "LiftAbout."

The hoist can be installed wherever a chain block could be used, providing electric current is available.

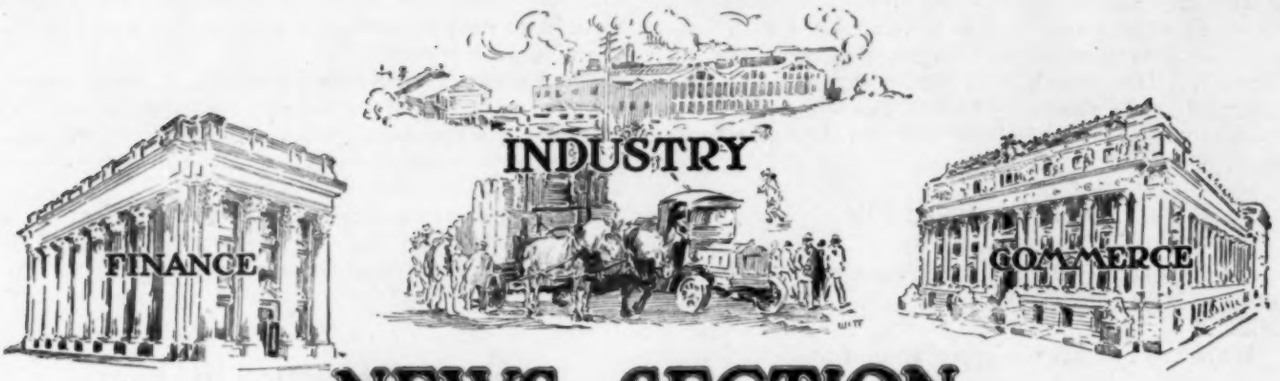
The motor is especially designed for hoisting service

SHEPHARD ELECTRIC LIFTABOUT

and can be furnished either for direct or alternating current.

Mining Machinery in Great Britain

The present is considered a very favorable time for American manufacturers of labor-saving mining machinery to stimulate the sales of their products in Great Britain, according to a report just received from Consul John R. Bradley, at Cardiff, Wales, who points out that the operators there are overlooking no opportunity to increase production and to decrease costs. Of course, it is recognized that for some time British labor has been opposed to the employment of such machinery, notwithstanding which fact it appears that more and more equipment is constantly being employed in the various British coal fields. Owing to the importance of coal as an export commodity and the absolute necessity of producing it at a price which shall be attractive in the world's markets, it is felt that public opinion in Great Britain is becoming increasingly favorable to the employment of such machinery.



NEWS SECTION

Railroads and Brotherhoods Sign Agreement

A recent report, verified by the American Association of Railway Executives, is to the effect that four of the leading railroad brotherhoods have signed agreements with railroads in the Eastern, Western and Southeastern districts whereby regional adjustment boards are to be set up as provided in the Esch-Cummins law. The Brotherhood of Locomotive Engineers, Order of Railway Conductors, Brotherhood of Locomotive Firemen and Enginemen and the Brotherhood of Railroad Trainmen are the organizations included in the agreement.

It is expected that the creation of these boards will relieve the Railroad Labor Board of the necessity for settling many minor disputes and so enable it to devote more time and effort to principal issues.

Each board will have eight members, one representing each brotherhood and four representing railroads in the particular district.

Engineering School in Springfield

Under the personal direction of William Roberts, consulting engineer, a new phase of technical education has been established at Springfield, Mass., in the organization of the Engineering School of Drawing, which has opened in that city.

The school has evidently filled a long-felt want, as judged by the full attendance at both the day and night sessions. The students in this novel course are given actual problems to work out, and are permitted, when capable, to work on drawings and plans for work which the school contracts for.

Mr. Roberts was formerly an engineer with the Bosch Magneto Corporation and the Rolls-Royce of America, at Springfield.

Army to Sell Castings

A lot of 13,500,000 lb. of motor forgings and castings are to be sold by the Air Service of the Army. Informal bids will be received until Dec. 10. They are to be sold on a scrap-metal basis. Quantities are as follows: Steel, 11,534,937 lb.; cast iron, 1,041,249 lb.; bronze, 750,000 lb.; aluminum, 189,022 lb.; brass, 12,407 lb. The materials are open for inspection at the Long Island Air Reserve Depot, Long Island City, N. Y.

R. R. Shops Not Sold

A current report of last week to the effect that the West Albany car repair shops of the New York Central Railroad had been sold to the American Foundry Co. has been declared erroneous by an official of the railroad. The shops are now operating, work having been resumed after amicable arrangements had been made at a conference between the employees and G. A. Carson, master car builder.

Willys-Overland Nearing Capacity Production

A recent report from Toledo, Ohio, quotes John N. Willys, president of the Willys-Overland Co. as stating that the company has orders for $50,000,000 worth of Willys-Knight and Willys-Overland cars. It is also said that the company plans to produce 150,000 cars in 1922, necessitating the employment of some 12,000 men in its main plant.

This great increase in business is due in part to a newly established sales plan in which the cars are sold direct through dealers, eliminating the distributors and hence a great deal of time and expense.

Worcester Foundries Change Hands

Agreements have been made for the transfer of the property of the Standard Foundry Co. to the Crompton & Knowles Loom Works and the sale of the foundry property of the Whitcomb-Blaisdell Machine Tool Co., owned by Boston interests, to the Standard Foundry Co. These concerns are all located in Worcester, Mass. The latter has been contemplating the erection of a large foundry at New Worcester, but with the acquisition of the Whitcomb-Blaisdell foundry, which will enable it to double its capacity, the former will not now be necessary. The Standard foundry is close to the loom works and the addition will permit the latter to make all of its own castings rather than have some of them made by outside foundries as has been the practice for many years.

Crompton & Knowles interests have always been financially in control of the Standard Foundry Co., a corporation, of which Charles F. Hutchins is president and treasurer. Robert F. Herrick and his associates in Boston own the Whitcomb-Blaisdell business and foundry property.

New England Engineering Societies Active

The New England section of the Society of Automotive Engineers had its fall meeting in Springfield, Mass., Nov. 18. In the afternoon the American Bosch Magneto Corporation's plant was inspected. There was a banquet at Hotel Kimball in the evening, following which E. B. Newill, engineer in charge of the isolated electric lighting plant section of the Westinghouse Company, in Pittsburg, read a paper on farm lighting plants. He told of the improvements in apparatus and the increased extent to which such systems have been installed in recent times. The meeting was under the direction of R. E. Thompson, chief engineer of the Westinghouse in Springfield. James A. Moyer, head of the division of university extension of the State Department of Education, presided.

The Engineering Society of Western Massachusetts had its November meeting on the 22d in Greenfield and Turners Falls. Power stations and the canal of the Turners Falls Power and Electric Co. were visited in the afternoon. A demonstration was given of the workings of the system, including the new hydro-electric station which supplies power to a 66,000-volt transmission system operating through western New England. Dinner was served at the Weldon Hotel in Greenfield, after which C. C. Chesney, manager of the General Electric Company's Pittsfield plant, spoke on the million-volt transmission experiments. Charles P. Perin, consulting engineer, gave an account of electrical developments in India. Members of the Engineering Club of the Greenfield Tap and Die Corporation attended.

Argentine Orders Equipment

The Argentine State Railways signed a contract, on Oct. 30, with an American manufacturing company to supply seventy-five locomotives, valued at $3,500,000, and with an American car company to furnish 2,000 freight cars, valued at $5,000,000, according to a report from Edward F. Feely, the commercial attaché of the Department of Commerce at Buenos Aires. Additional credit amounting to $1,500,000, in which both firms will participate, will be opened in favor of the State Railways for the purchase of supplies and spare parts. The total credit is for a period of five years and amounts to $13,000,000.

Lenin Admits Defeat of Communism in Russia—Financial Help From Outside Needed To Restore Government and Business

By Our Latvian Correspondent

On October 17 the government of Soviet-Russia founded, by a special decree, the State Bank of Russia with a capital of two thousand milliard paper roubles.

It is not the re-opening of the former State Bank of Russia, because there is nothing left from the old bank. The former State Bank of Russia was closed some years ago as a "pernicious institution which should not have place in an honest socialistic country."

The banks were regarded by communists as the chief social evil, as the chief supporters of the despised capitalistic regime, because they helped to accumulate the wealth in the hands of individuals and to enslave the poor. In a communistic state there should be no riches, all should be equal, and the banks, preventing such unequality, were regarded as superfluous and pernicious.

Formerly all the money drawn in the form of taxes or otherwise for the public service was consigned to the State Bank and likewise all drafts for the public service were made on it. When the communists began to re-organize the state, adopting it to the communistic regime, all taxes were abolished, all public services (postal, telegraph, railroad, electricity, hospitals, etc.) became costfree, industry was nationalized, free trade prohibited, all was concentrated in the hands of the government. After that nobody asked about credit, or about open money transactions. The communistic government decided to destroy the capitalistic monetary system by printing paper money as much as possible. All banks were closed and securities confiscated.

Some experimental years passed and in the last months the communistic government of Russia made all public services payable again, introduced taxes, allowed free interior trade, denationalized the industry, restricted the rights of laborers, violating by it the doctrines of Marx. Now they are opening the banks and trying to stabilize their paper rouble.

Thus, by restoring the old "despised" capitalistic organization the communists returned to the starting point whence they went four years ago towards a real socialistic regime.

What caused the communists to turn aside from their course taken four years ago? Why were they not able to establish the socialistic régime in Russia? Are the communists able to restore sound economic conditions in Russia? These questions are of great importance for the whole world. The communistic doctrines of Marx are yet in favor among laborers in countries where they are not yet applied to everyday life as in Russia. The real practicability of the doctrines were not finally tested till now. Russia was the experimental laboratory for this task and the experiments were in continuity till the last months. Now when the experimenters returned to the old capitalistic régime, putting aside the Marx's doctrines, we know the test is finished, the Marx's doctrines lost their prestige and—in order to reach a better life—the world has to find other, more trusty means and ways.

In the very beginning of their régime the communists hoped that under their management everybody would deliver his belongings to the common household, would work willingly for the whole community and—in exchange for his work—would receive from the government a definited, part of the commodities and services necessary for his living.

Money then should become superfluous and personal work the sole measure. Who does not work, is not able to exist. The money was to be destroyed, not by confiscating it—because it could be hidden—but by destroying its value. To destroy the value, money has to be printed and distributed as much as possible.

This decision was accepted by the communists immediately after the overthrowing of Kerensky in October, 1917. One should note the sudden rising of the amount of paper money in November, 1917.

The amount of paper money in Russia was (in Milliards=1,000,000,000):

August,	1914	1.7 M. roubles
January,	1915	3.1
"	1916	5.7
"	1917	9.2
November,	1917	19.0
January,	1918	27.0
"	1919	61.0
"	1920	225.0
"	1921	1168.0

It was easy for the communists to force the whole population to compulsory work (for the common welfare). They invented different methods and kept everybody pretty busy. But they failed to deliver—in exchange for the work — the promised commodities necessary in everyday life.

The population, in spite of the communistic agitation, failed to be sensible and not everybody wished to work for the common welfare. The laws were changed by paper decrees, but the psychics of the people could not be altered so easy. The bayonets, bullets, sentences of death, prisons, famine and other punishments were not able to make compulsory work productive. The productivity decreased almost as quickly as did the value of the paper money.

At the end of 1920 the productivity of Russian industries, in comparison with the same in 1916, was as follows (the figures are from an official government report):

Industry	Percentage
Iron mining	2.25
Copper "	0.60
Manganese "	2.60
Asbestos "	6.00
Salt "	17.00
Coal "	20.00
Pig iron industry	2.20
Semi-finished products	2.30
Agricultural machinery	1.50
Cotton tissues	4.00
Flax tissues	25.00
Sugar	7.00
Matches	15.00
Paper	10.00
Rubber	5.00

Communism All Wrong

By the management of communists the country is driven to a nonplus, there is famine and poverty, all is destroyed, foreign credit and sympathies are lost.

Here is demonstrated the impracticability of the communistic doctrines and the inability of the labor class to manage the government's affairs.

Of course, the masses are highly malcontent and the general opinion prevails that the sole salvation lies in the abandonment of the communistic régime. The majority of the communistic leaders, it seems, are recognizing the truth, that their radical ideas were wrong or at least, unapplicable in the present world's organization.

It is interesting to read the explanation of the new economic policy of the communistic Russian government. It sounds like this:

The former financial policy of the war-communismus was based on the using of emission, as the sole resource of income, reports the commissary of finances; the task was to make the money valueless and useless in economic life. Now when private property and private rights are recognized and we have free trade, such a task is out of question. We must think, how to stabilize the money.

Formerly the intention was to keep the whole economic activity in the hands of government. Now, when private initiative is again freed and there is a free exchange of commodities, the former financial policy has to be entirely changed.

We have to stop the emission, because we do admit that an excessive emission is preventing the development of a sound private economic activity. It requires a strong medium of exchange and it is impossible to manage the state without that.

In order to curtail the emission we are introducing taxes, payable in money. All public services are to be paid by the users. All payments in kind to the laborers and employees will be stopped.

To this time the soviet government acted as a social provider; henceforth it will act as a calculating master who manages his household without deficit.

Lenin Surrenders

Lenin in his recently famous speech was more open.

"Our new economic policy," he declared, "lies in the strategic retreat; before we are totally defeated, let us retreat and rebuild all anew, but more solidly.

"Our old economic policy was not able to evoke the productive power, which by the program of our party was fixed as the fundamental task. . . . We are defeated and retreating.

"Our new economic policy denotes that the peasants will have free trade. The concessions to foreigners and the leases to capitalists—it is the restoration of the capitalism. . . It is evident that capitalism has to grow."

"The fundamental question is—who will first make use of the new conditions? Will the peasant join with the proletariat or with the capitalist?"

"The question is—who will outrun? If the capitalists will succeed, they, no doubt, will whip off the communists. If the proletariat, joined with peasant, will be able to keep the capitalist in check, we have won."

"Remember, the capitalists of the whole world are against us and they are stronger than before."

"Our activity should not be based on the direct transition to communism, the peasant has to take interest in the socialistic régime. Here we failed. So

long as the masses remain indifferent, it is impossible to maintain the compulsive régime. Until now we were not able to interest the masses in our scheme."

"We have to base every branch of our industry on everybody's personal interest. Collective advisement, individual responsibility. . . We have to carry on this policy with a strong hand."

"No country has so many meetings as we have. . . One should understand what is fit for the meetings, what for the management. . . Manage more firmly than the capitalists, otherwise we all shall be hanged up and that will be deserved; do not chat, if you have to manage."

"The capitalists and concessionaires will earn a hundred per cent profit beside you. Let them do it. You have to learn to do the same and only after that will you be able to carry on the communism."

" . . We must admit, that the conditions have bettered after we introduced the new economic policy. . ."

Communism in Russia will die a slow death. It is dying already. The communist leaders will help destroy the communistic régime because they are human beings and wish to keep their offices. They are adapting their activity to the wishes of the masses.

In order to stabilize their aenemic paper rouble, to minimize the work of the printing press, the communists introduced taxes and made the public services payable. What are the actual revenues?

During the first month, after the taxes were introduced, there were the following revenues:

From	railroads.....	18	milliard roubles
"	trade taxes..	3	" "
"	lease of buildings	1	" "
"	Moscow street cars	2	" "

The collected amounts are of nothing, if we remember that the government budget for the 1921 amounts to six thousand milliard roubles, with, perhaps, 95 per cent deficit.

All the budgets of Russia in the last six years were deficient. The shortage was: Year 1915, 75 per cent; 1916, 75 per cent; 1917, 82 per cent; 1918, 67 per cent; 1919, 77 per cent; 1920, 87 per cent.

We have no information about the proposed deficiency in 1921 but it should not be under 95 per cent.

The surest way to derive the necessary six thousand milliard roubles lies again through the printing press. It is impossible to predict what will be the value of the paper rouble at the end of 1921. It may happen the proposed budget will not suffice to cover the government's expenditures.

Could not the paper money be redeemed by platinum, gold or silver?

If the information is true, the government is coining silver roubles. The fixed amount should reach some hundred million roubles. As we understand, these silver roubles will be used on foreign markets.

As to the platinum, there were rumors that Russia will coin platinum money. True, Russia has the best platinum mines, but in 1920 these mines produced only about 20 poods (one pood = 36,11 avoirdupois pounds). In July, 1921, there were produced 2 poods, 20 pounds.

We doubt the communists have considerable reserve of this precious metal. If they had, it should have been sold in foreign countries long ago; the needs of Russia are too many.

Russia has rich gold mines, but their output at present is very small.

In 1920 all the gold mines of Russia produced about 90 poods of gold. The future hopes were brighter and the output for 1921 was fixed as follows:

From Ural mines, 71 poods; West-Siberia, 27; Middle-Siberia, 58; East-Siberia (Lena), 120; total, 276 poods.

The output was fixed and expected but it will be much smaller. Thus, according to reports for the current July month there was produced:

In Ural mines, 1 pood 10 pounds; West-Siberia, 26 pounds; Middle-Siberia, 14 pounds; total, 2 poods, 10 pounds.

It seems, in 1921 there will be produced only a few poods. Why could not the Lena mines be operated again with full capacity? That is a question to be answered apart. In short, they can not be operated under the present communistic régime.

If we remember that in 1912-13 all the gold mines of Russia produced 3,635 poods of gold, valued at 30.4 millions, and compared this quantity with the present output of, perhaps, 70 poods, all the rumors of Russian gold reserves must grow calm.

In 1914 Russia produced 611 poods of platinum, that was 94.1 per cent of the whole world's platinum output. In 1920 she produced only 20 poods.

In 1912 Russia produced 923 poods of silver. We have not dependable information about the silver output in 1920, but it could not be comparatively better than the gold and platinum.

Increased export? Of course, there is some help. Although there is famine and poverty in Russia, her exports increase. Here is no place to go in details, but the export of Russian flax, lumber, bristles, furs, etc., is rather large. The famine, the worn-out machinery and railroads, etc., require help.

The best solution of the Russian financial problem would be the help of foreign credit. The foreign credit has to wait for some more important decrees, some more changes in the new economic policy of Russia.

Steel Treaters Compare Methods of Manufacture

At the November meeting of the American Society for Steel Treating, held in the Engineering Societies Building, New York City, last week, T. H. Nelson, works manager of Henry Disston & Sons, Philadelphia, Pa., lectured on "How Tool Steel Is Made: Comparison of Foreign and American Methods of Manufacture." Mr. Nelson illustrated his remarks with a series of lantern slides showing the preparation of steels and manufacturing processes.

Dr. Frederick Giolitti, the well-known Italian metallurgist and authority on case hardening, was a guest of honor at the meeting.

The lecture season, from December to June, has been well laid out with a series of practical talks on steel treating and related subjects. George L. Norris is in charge of this activity of the association and he promises some interesting meetings.

Postmaster Hays On Tariff

In the course of an address before the Fifth Avenue Association, in New York, Nov. 15, Will H. Hays, the Postmaster General, made significant references to the tariff situation. His utterance in some quarters at least is interpreted to mean that there will be no effort to hurry the enactment of the tariff bill. An extract from Mr. Hays' speech is as follows:

"Before 1914, we were a debtor nation—the largest in the world. Today, we are precisely the opposite. We are the largest creditor nation in the world. Just what is the effect of the enormous importance of this change in our economic and commercial position in relation to the rest of the world I do not pretend to know. I merely point out that no thorough or open-minded or candid consideration of the tariff question can be complete without including consideration of this new factor. Regardless of what an investigation of this point might reveal —omitting this factor altogether, it is a fact that to thoughtful men there must be approval of a certain hesitation and disposition to be cautious and a determination to be sure footed in the consideration of the whole subject of the tariff. Conditions throughout the world are so chaotic that it's difficult to foretell exactly what is needed. The very basic condition on which a tariff is built—the cost of manufacturing in various European countries with relation to our own cost of manufacture, and the value of the currency of the various European countries with relation to the value of our own currency, is at the present moment as fluctuating as quicksand. To build a dependable tariff on such a foundation is difficult, of course. It has been thought by many that we could overcome these handicaps by a device which is called American Valuation, and which provided that all customs duties shall be estimated upon the value of goods at the time when they arrive in the United States and in terms of American money. The Congress in a proper eagerness for information has made an appropriation of $100.000 to investigate the device and otherwise determine what might be done to help us toward writing a permanent tariff. This was proper, but a much better arrangement and one which is very definitely in the mind of the administration for accomplishment, is to make the Tariff Commission a really useful and functioning institution which will constantly study the situation and with sufficient authority, which ought to be given it, be able to meet any and all conditions which obtain or emergencies which may arise. The work of the special investigation has been going on and with the adjustment of our international relations by the accomplishment of the steps which the President has in mind we may expect relief from some of the conditions of fluctuation and instability so that proper permanent tariff making is possible."

British Motor Tax Receipts

The number of motor vehicles of all kinds registered in Great Britain from Jan. 1 to Aug. 31, 1921, was 870,782, and the gross amount of taxes collected was £9,876,105, which is distributed as follows: England and Wales, £8,777,-863; Scotland, £888,227; Ireland, £210,-015.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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Thanksgiving, a peculiarly American holiday, has been described as a "festival of hope in a land of hope." The description certainly fits the day we celebrated last week, for all over the country there was to be discerned a revival of optimism as the people stopped work and contemplated for a few hours the blessings they enjoy.

The news from the Disarmament Congress encourages the hope that an effective agreement along the lines of the Hughes proposal will shortly be reached and that under it the world will be able to quickly redevote itself to the arts of peace. The most important product of the Congress remains nevertheless the sentiment created and the better understanding between the nations that has been promoted.

The United States Congress has adjourned after passing a tax bill which pleases no one, and is described by Senator Smoot as generally and properly "condemned by the American people," but we can at least be thankful and hopeful because there is an election in November, 1922, at which an entirely new House of Representatives and thirty-two new Senators may be chosen.

Still another reason why business men should be thankful is to be found in a letter from the New York Federal Reserve Bank to the member banks of that district in which they are instructed to report the rate of interest charged by them on paper offered for rediscount. This is assumed to be a feeble effort to restrain profiteering among the banks that deal with the public and, while those who are sarcastic are calling attention to the fact that it comes from an institution which made a profit of 129 per cent on its capital last year, it is at least to be commended as indicating a sensitiveness to criticism which it is to be hoped will become more general among Federal Reserve officials.

This I say because many of those who read this letter have of late been writing me asking why they should be charged 7, 8 and even 9 per cent for bank accommodation when the Federal Reserve rediscount rates are so much lower. Such rates would seem to be unjustifiable when good commercial paper is easily salable in New York at 5 per cent, and I advise those borrowers who feel oppressed to put the facts before the Federal Reserve Bank in their district. The buyers of credit are about the only class in the community who have not resorted to a "buyers' strike," and it is about time they acted, for the ever-increasing accumulation of gold seems to make still lower rates a certainty.

Net gold imports for the year up to Nov. 10 were $604,000,000, which is about one and a half times the world's gold production in that period and unless the accepted laws of finance are fallacious or suspended the effect of this continued influx must be to increase the price of other things as expressed in terms of gold. By impounding the gold in the banks and restricting credit by high interest rates bankers have until recently succeeded in averting what some of them have called "gold inflation," but from the action of the markets last week it seems doubtful whether it will be much longer possible to keep people from exchanging cheap money for things that are really more valuable. Take cotton for instance. Years ago Wm. B. Dana said that because it was instantly convertible and could be held indefinitely, cotton was more nearly money than any other form of merchandise. It advanced sharply last week in the face of a ginner's report that indicates a crop far in excess of the government estimate, but still too small for the needs of a normal world. In the trade the advance is ascribed to various technical factors, but the real reason is probably a subconscious appreciation of the fact that under present conditions cotton is cheaper than gold. The same statement applies to grain. Wheat is 11 cents above the lowest and corn is again selling at over 50 cents in Chicago, not because there is any change in the relation of supply to demand, but because money has become or is becoming worth less than food at current prices. Copper, another article that has many attributes of money, is again higher and probably for the same reason.

In the security market the same influence is at work. Liberty Bonds are at the highest of the year. Some issues are in fact higher than since January, 1919, and other bonds, taxables as well as tax exempt, are in eager demand at advancing prices. New issues which total possibly one hundred millions a week are readily absorbed. Because of the ease with which bonds can be sold, the government will probably be able to dispose of all the railroad obligations that it holds, thereby putting itself in funds to finance the roads so that the passage of the refunding bill will be unnecessary. Railroad earnings for October thus far reported are better than expected, and as rates are reduced and traffic stimulated they will probably show further improvement. Some confident buying of low-priced railway stocks is at last noticeable, and the entire stock market is distinctly firm. It seems to be only a question of time when the plethora of money will be felt in a general revival of stock speculation.

Even export credit men, who have had greater reason to be depressed than many who have talked more loudly and despondently, are finding conditions on the mend. At a meeting in New York last week they reported increasingly successful efforts of foreign firms to pay off their indebtedness to our merchants, marked depletion of stocks abroad, and reviving inquiry in our export markets.

Reports from the automobile, petroleum, rubber, iron and steel, and hide and leather centers all show increasing cheerfulness and steady markets. Building and building materials continue active, and cement production during October was the largest ever recorded in a single month. The boom in the fur trade is almost phenomenal. I have been assured by three different manufacturers that they have seldom known better business. There are, however, a few clouds. One of them is a decline in wool at auctions abroad which probably will have to be reflected here, and the quietness and labor troubles of the woolen goods trade. The sugar market is somewhat easier and cattle and hog prices have declined further despite the steadily increasing assistance given by the War Finance Corporation to livestock raisers.

Another cloud is the ever present financial predicament of Germany. Not only do her printing presses turn out their weekly increment of marks, but her export trade is steadily declining and her capacity to pay for her imports, let alone her reparations indebtedness, is even more uncertain than it was at Versailles. It is generally admitted that it is futile to expect her to pay 500,000,000 gold marks on January 15.

Fears, however, that this failure will involve French finance in serious difficulties seem not well founded, for remarkable progress has been made in repaying debts due by the State to the Bank of France, hence reducing inflatoin. The British Empire, barring ever present Irish and Indian threats, sends cheerful news and London expects sterling to continue to advance. Russia's trade is increasing and the establishment of a state bank with all the functions and liberties of private banks is one of the most important steps yet taken in restoring a capitalistic system.

On the whole, the sunshine lights by far the largest area and in our country particularly the shadows are so nearly gone that we have every reason to be profoundly thankful and rationally confident of the future.

Engineer Reserve Corps

In an effort to co-ordinate regular academic training, with that in military engineering, engineer units of the Reserve Officers' Training Corps have been established in twenty-one technical institutions, as follows: Massachusetts Institute of Technology, Yale University, Carnegie Institute of Technology, Virginia Military Institute, Virginia Polytechnic Institute, Alabama Polytechnic Institute, University of Alabama, University of Tennessee, University of Cincinnati, Rose Polytechnic Institute, University of West Virginia, University of Illinois, Iowa Agricultural and Mechanical College, University of Iowa, University of Kansas, Missouri School of Mines, Colorado School of Mines, California Institute of Technology, Oregon Agricultural College, Johns Hopkins University, State College of Washington.

Under this arrangement 3,500 students are enrolled this year, as against 2,800 last year. After four years of instruction, totaling some 600 hours, the student is commissioned in the Engineer Officers' Reserve Corps.

Industrial Standardization in Germany

Digest of Information Secured by D. G. Agnew, Secretary, American Engineering Standards Committee, in Germany, England and Other Countries

Insufficient attention has been given to the role which standardization is playing in German industrial reconstruction. The German industries are planning and are carrying out a far-reaching program of standardization as a necessary step in building up an unprecedented industrial structure which must rest in large measure on an extensive foreign trade. The German work is of special interest to those responsible for the management of American industries, not only because of its importance, but also because of the similarity in the historical conditions surrounding the national standardization movements in Germany and America.

Prior to 1917 a vast amount of standardization work had been carried out in Germany by individual companies, and by engineering societies and industrial associations, but, as was the case in America before the organization of the American Engineering Standards Committee, the work had not been unified along national lines.

As has been the case with all the other national standardizing bodies except the British, which was organized in 1901, the success of the standardization work carried out by all the various countries during the World War as a part of their national programs, was a chief cause of the formation of the central German body. It is called the Normenausschuss der Deutscher Industrie, and was organized by the Verein Deutscher Ingenieure, at the suggestion of the German government in 1917. The present membership consists of engineering societies, industrial associations and government ministries, and in addition there are 700 firms who are contributing members. The work of the Normenausschuss deals only with those subjects which concern two or more industries or branches of industry.

It is remarkable that the national standardization movement in Germany should have been so thoroughly organized and that so much work should have been accomplished in four years, for 144 approved standards sheets have been issued and over 500 others have been so far developed that they have been published in tentative form. The standards are issued under the general designation of "German Industrial Standards." The Germans were the first of the national bodies to publish standards in loose-leaf form. The work is so divided as to make each sheet as nearly independent as possible. Firms purchase these sheets in quantity, issuing them directly to designers, draughtsmen and foremen for use as working drawings and data sheets. The sale of sheets amounts to about 100,000 monthly. This plan is now followed by the Austrian, Dutch, Swedish and Swiss bodies.

The organization provides an extensive information service on standardization work in Germany and other countries, which is available to the industries as well as to their working committees. This is along much the same lines as the information service which has been started by the American Engineering Standards Committee. In this connection it is interesting to note that in general the German and Japanese industries appear to study foreign developments much more closely than do those of other countries.

Organization and Methods of Work

Next to the American Engineering Standards Committee, the German organization is the most decentralized of the national standardizing bodies. There is a main committee composed of representatives of the various national organizations supporting the movement and a smaller executive committee. The detailed technical work of each project is in the hands of a working committee which in Anglo-Saxon countries would be called a "sectional committee," i.e., a committee made up of representatives of all bodies interested in the particular subject in hand.

Proposals for new subjects for standardization must come from some responsible body. The industry concerned is consulted, generally by a conference of the various organizations interested, to determine whether it is the consensus of opinion that the work should go forward. In case it is decided to undertake the work, the conference designates the chairman of the working committee.

The central office digests the information available on the subject for the use of the working committee. When agreement is reached in the committee on the draft of a standard it goes to the central office for editorial work. There it is scrutinized to see whether it is consistent with other standards; whether points have been included which concern other working committees; whether the drawings and nomenclature are in approved form, etc. After this editorial checking the central office has the draft of the standard put into proof form. It is then reviewed by an official clearing house committee, which contains a representative from each major line of work being carried on by working committees. If any change in substance has been made, it goes back to the working committee. If no such change has been made, it is published in the *Mittielungen*, the official publication of the Normenausschuss, as a tentative proposal. Upon recommedation of the working committee, the standard is mailed to the members of the executive committee with a supporting statement. With their approval it is then republished as an official proposal. Six weeks are allowed for criticism when a standard is finally published unless additional important criticisms are received.

Work in Special Industries

The foregoing refers to the work of the central body only, which is limited to subjects common to two or more industries. In addition there are some fifteen organizations known as special industry committees, each of which deals with the standardization work peculiar to a single industry, such as shipbuilding, electrical, agricultural, automotive, elevator, locomotive, paper, textile and woodworking.

These committees are closely affiliated with, but not strictly an organic part of, the central body. They are organized not by the Normenausschuss, but by one or more technical or trade associations concerned with the particular subject in hand. Standards formulated by the special industry committees are published by the organization responsible. In most cases the final standards are published in loose-leaf form modeled closely after that of the standards issued by the Normenausschuss itself. These standards are submitted to the Normenausschuss before publication, in order to keep them consistent with the regular series of German industrial standards.

The volume of work being carried out through these special industry committees appears to be at least as great as that under the direct control of the central body.

Characteristics of Continental Work

Looked at broadly, and with exceptions such as must always be made in general statements of the kind, the continental countries are going much further into dimensional standardization than are the Anglo-Saxon countries. This includes interchangeability of supplies and of machine elements, the interworking of parts and of related apparatus made by different makers, and the interchangeability, so far as the use is concerned, of complete machines and apparatus. By far the greater part of the work of the Normenausschuss is dimensional, greater attention being paid to such matters as machine elements, screw-threads, bolts and nuts, standard diameters, and systems of limit gaging. The Anglo-Saxon mind takes more to matters having to do with purchase and contract, such as specifications for materials, and for performance of apparatus, methods of test, etc. The Normenausschuss itself has done very little of this type of work as yet, but it has been highly developed by some of the German special industry committees, for example, in the electrical industry. Some of these special industry committees are very active in the elimination of types, sizes and grades of manufactured products, and a special word, "Typung," has been introduced for this type of work.

On the Continent there is a greater dependence upon theoretical and fundamental considerations, the Anglo-Saxon temperament giving rise to a much larger degree of expediency in adjusting commercial considerations in the process of arriving at agreements.

German manufacturers will go farther in yielding apparent temporary commercial advantages for the sake of advancing their national industry as a whole, than is the case in America or Great Britain. Three principal reasons for this are: the great economic pressure under which German industry is laboring; the mental trait of more readily acquiescing in decisions affecting national welfare; and the belief that an essential to the rehabilitation of German industry is the rebuilding and great enlargement of their export trade, for which the importance of standardization on national lines is more readily apparent than it is in the home market and domestic trade.

The Germans have not yet had their

standards translated into foreign languages for use in export, as the British are doing, but they are now giving consideration to this question.

"PREFERRED NUMBERS"

As typical examples of the German work, their system of "preferred numbers" and their standard series of handles may be mentioned. The first is a fundamental piece of work, founded on theoretical considerations and of the first importance. It is a simple system of numbers for use in all new standardization work, in which gradated numerical values are required, such as standard gradated diameters of pulleys, thicknesses of plates, or capacities of machines. The Germans believe that its use will lead to great economies in material, in reducing the number of sizes, ranges, etc., simplify the carrying of stocks and facilitate interchangeability. It may be shown theoretically that, under average conditions, a given number of standard sizes laid out according to these numbers, will be better fitted to any series of jobs taken at random, than would be the same number of sizes laid out in any other way, and this with a minimum of material.

The standard handles furnish a typical example of German love of thoroughness of detail. There are two shapes, each adapted to a particular method of use, and there is a series of sizes for each shape. The profiles have been worked out with the most extreme care, an efficiency engineer having been employed to make time-motion studies to determine the exact profile that would insure the greatest accuracy in operation with the minimum fatigue of the workman's hand. It is felt that by doing a thorough job once for all, different industries and firms will be saved from doing the same thing over and over, but always less well, and that at the same time interchangeability is introduced.

INDUSTRIAL SIGNIFICANCE

The standardization movement in Germany is particularly significant, since Germany is one of the three leading industrial countries. The industries of Austria, Holland, Sweden and Switzerland are so intimately related to those of Germany on acount of geographical and other relationships, that they are necessarily affected very largely by developments in Germany. It appears that the work is being woven very intimately into the industrial fabric. The very large number of standard sheets purchased by the industry, and the fact that the central organization has 5,000 firms which are co-operating members, are a sufficient indication of the thoroughness with which the Germans pursue their aim.

There seems to be a striking analogy between the present standardization movement in Germany and the research movement developed there a generation ago. Whatever estimate one may place upon the rôle it played in German industries generally, everyone agrees that research was fundamental in the development of the great chemical industries. The rôle which the Germans are expecting standardization to play in all their industries would be not unlike the rôle which research has played in their chemical work. A copy of a report on this subject, which was rendered to the American Engineering Standards Committee by its secretary, will be sent upon request.

Ordinary Expenses of Government for October

Ordinary expenditures of the government increased by more than $37,600,000 during October as compared with September, while disbursements on the public debt fell off by about $627,000,000, according to the monthly statement issued by the Treasury.

During October ordinary expenditures totaled $304,157,955 as against $266,523,932 in September, while public debt disbursements for the month amounted to $546,394,200, compared with $1,173,842,743 in the previous month.

Interest on the public debt amounting to $130,000 was the largest item under ordinary expenditures for the month, while $457,571,000 in certificates of indebtedness retired was the largest item under public debt payments.

United States Civil Service Examinations

The United States Civil Service Commission announces open competitive examinations for junior technologist on Jan. 11, March 8 and May 17, 1922. Vacancies in the Bureau of Standards, Department of Commerce, for duty in Washington, D. C., or elsewhere, at $1,200 to $1,500 a year, and in positions requiring similar qualifications, at these or higher or lower salaries, will be filled from these examinations. As the higher-salaried positions are usually filled by promotion, appointments are usually made at the lower salaries, but persons showing in their examinations that they are unusually qualified are occasionally appointed at the higher salaries.

All the citizens of the United States who meet the requirements, both men and women, may enter these examinations; appointing officers, however, have the legal right to specify the sex desired in requesting certification of eligibles.

The Bureau of Standards covers a wide field of work in physics, chemistry, engineering and industrial technology, including research and standarization, and offers valuable experience in these professions, combining as it does theoretical, experimental and practical work. The duties of the appointee will be in connection with original investigations in some field of the bureau's work. The chances for advancement are good for those who prove capable. Experience in the bureau is considered an admirable training for scientific work, and its close connection with the industries makes particularly valuable as a training in industrial research. The bureau's facilities make it perhaps the best equipped physical laboratory in the world.

Examinations will be given in the following optional subjects and applicants must state in which they desire to be examined: Rubber technology, leather technology, paper technology, textile technology, oil technology, general technology.

For the purpose of this examination the word "technologist" shall be construed as applying in connection with some industrial manufacturing process where said manufacturing process is based upon the fundamental principles of an applied science.

Further information can be obtained from the Department of Commerce, Washington, D. C.

Schwab Speaks for Steel Industry on Disarmament

Concentration of the energies of mankind upon constructive rather than destructive activities will make possible greater permanent prosperity for the steel industry than will armanent competitions, in the opinion of Charles M. Schwab. Among the thoughts expressed by Mr. Schwab at the dinner given Marshal Foch by the American Iron and Steel Institute, in New York, on Nov. 18 were the following:

"From the beginning to the end of the war, our industry furnished for war purposes nearly fifty million tons of steel. The mere figure does not picture to the mind what that means. And yet fifty million tons of steel would build a modern railway ten times around the earth.

"During the war we talked of a bridge of ships across the Atlantic. Fifty million tons of steel put into the hulls of ships would actually build a bridge of ships from the United States to France.

"It was truly a war of material and machines as well as of men, and, we, of the American iron and steel industry like to think, not that we won the war, but that we accomplished in full the part that was assigned to us.

"I am at the head of the largest war materials manufacturing works in the world. The shipyards of my company build more naval ships than are built in any other yards under one management in the United States. But, I have been thrilled beyond expression, as has every good American, by the brilliant and statesmanlike scheme laid before the Conference at Washington by Secretary Hughes. The carrying out of that plan may involve great monetary loss in some quarters, but such a thing as financial loss can be of no consideration when compared to the inestimable boon to mankind which would be involved in the realization of that magnificent plan. What red-blooded American would not, indeed, make any sacrifice if the burden of armament could be lifted from the shoulders of humanity. May God speed the day when this noble conception can be realized!

"If disarmament inflicts a money loss upon us, the American iron and steel industry will accept it willingly and gladly. We will do so not in a spirit of mere idealism and self-sacrifice, but in a belief that the greatest permanent, material prosperity would be brought about by the concentration of the energies of mankind upon constructive activities; upon means for well-being, and not for the destruction of civilization."

Taylor Society Now in Session

The annual meeting of the Taylor Society opened today with the annual business session as the first event on the three-day program. The meeting is being held in the Engineering Societies Building, 29 West 39th St., New York City. Thursday will be devoted to a general public session; Friday to sessions for sales executives and plant managers. Friday afternoon there will be a session for office managers and on Saturday morning a period will be given over to labor managers.

On Saturday afternoon there will be a luncheon for Henry R. Towne, honorary president of the society.

Economic Research Bureau Shows Nation's Income

Some interesting figures on the extent and distribution of the income of the United States are furnished in a report just issued by the National Bureau of Economic Research. This organization was formed for the purpose of finding and placing before the public the facts in regard to economic questions. Its board of directors is composed of men of widely divergent views, but each report must be approved by all the directors.

This report states that the total national income increased very greatly between 1910 and 1919, when measured in current dollars; it increased less when calculated in unchanging dollars based on 1913 prices; the per capita income in terms of 1913 dollars increased still less. These facts are brought out in the following table:

	Total National Income (Billions)	Per Capita Income (Dollars)	Total Income in 1913 Dollars (Billions)	Per Capita Income in 1913 Dollars (Dollars)
1910	$31.4	$340	$32.2	$349
1911	31.2	333	31.7	338
1912	33.0	346	33.2	348
1913	34.4	354	34.4	354
1914	33.2	335	33.0	333
1915	36.0	358	35.2	350
1916	45.4	446	40.7	400
1917	53.9	523	40.8	396
1918	61.0	586	38.8	372
1919	65.9	629	37.3	358

In 1918, which is the year concerning which we have the best information, 1 per cent of the income receivers obtained 14 per cent of all the income; 5 per cent obtained 26 per cent of the income; 10 per cent had 35 per cent of the income, and 20 per cent had 47 per cent of the income.

One of the most interesting tables shows how the product of the large, organized industries is divided between investors and management on the one hand, and salary and wage earners on the other. The record by years is as follows:

	Share of Investors and Management Per Cent	Share Paid in Wages and Salaries Per Cent
1910	31	69
1911	28	72
1912	28	72
1913	28	72
1914	26	74
1915	28	72
1916	33	67
1917	31	69
1918	23	77

This appears again to indicate that the shares vary materially with periods of prosperity and depression, and bears out the general indication that our participation in the war was accompanied by a lessening of inequality of distribution.

The sources from which the income is drawn maintain a remarkably steady relation over the ten years studied. Taking a general average, agriculture contributed 17 per cent of the total; manufacturing 30 per cent; transportation about 9 per cent; mining a little over 3 per cent; banking over 1 per cent, and government about 5 per cent. The large group of the miscellaneous, such as merchants, retailers, professional men, domestics, various forms of service and others too numerous to mention, contributed in the aggregate about 33 per cent. The share of agriculture increased from 16 or 17 per cent in the years 1910-16, to 18 and 21 per cent in 1917 and 1918. It is as yet too early to get the final results for 1919 and 1920.

The time honored opinion that America is a nation of spendthrifts is brought into question by the report. The savings of individuals going into extension of plant as represented by new corporate issues of securities; public improvements financed by state and municipal bond issues, and the great number of private houses built each year, all these mount up to a large total. The bureau is now engaged in making a more precise estimate of these yearly totals.

Corporation Savings

In addition, the bureau points out the great importance of savings by corporations. These are distinct from individual savings, and consist of the earnings of corporations which are not paid out as dividends but are laid aside as a surplus and used for new investments or extensions of plant. From the point of view of the stockholders, they are involuntary savings made by the corporation for their benefit. In the aggregate, they mount up to a large total.

Year	Corporate Savings (Billion Dollars)
1910	$1.2
1911	0.9
1912	0.9
1913	1.0
1914	0.5
1915	1.6
1916	3.9
1917	3.4
1918	1.7
1919	1.3

All of this indicates that despite the free spending of the American people they directly or indirectly manage to increase the national wealth at a surprisingly rapid rate.

Obituary

J. N. D. Reeves, 77 years old, retired president of Reeves & Co., Columbus (Ind.) machinery manufacturers, died recently at his home in Plainfield, Ind. He lived at Columbus the greater part of his life, making Plainfield only a temporary home. He was well known to business men throughout the state.

J. Frank Durston, for many years one of the leaders in industrial activity in Syracuse, N. Y., died at his home there on Nov. 16. Mr. Durston was president of the Durston Gear Co. of Syracuse, which was the successor to the Le Fevre Arms Co. of which he was also president. Besides this he was president of the Sanford Motor Truck Co.

George W. Eccles, general manager of the Davis & Farnum Manufacturing Co., of Waltham, Mass., died suddenly on Nov. 11. He was 50 years old.

A. A. DeLoach, head of the A. A. DeLoach Co., of Atlanta, Ga., manufacturer of mill machinery, and internationally known as the inventor of the DeLoach turbine water wheel and friction-driven sawmill engine, died Sunday, Nov. 20, at his home in Atlanta following an extended illness.

Forthcoming Meetings

The annual meeting of the Taylor Society will be held in the Engineering Societies Building, New York City, on Dec. 1, 2 and 3.

The annual meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, New York City, on Dec. 5 to 9.

A dinner-meeting of the Metropolitan section of the S. A. E. will be held at the Automobile Club, New York City, on Dec. 15.

Increase in Exports of Machine Tools

While exports of metal working machinery increased slightly in October over those of September, the total exports movement is so small as to be almost insignificant. The value of all metal-working machinery exported during October, 1921, was $680,931. Brazil made heavier purchases than any other single country. The falling off of purchases by the United Kingdom, British India and by Japan were most marked. The detailed figures, which are those of the Department of Commerce, are as follows:

	Oct., 1920	Oct., 1921
Metal-working machinery:		
Lathes	$358,088	$146,128
Other machine tools	1,170,075	143,224
Sharpening and grinding machines	247,788	89,272
All other	1,556,908	302,307
Total metal-working machinery	3,332,859	680,931
Exported to:		
Belgium	124,676	6,337
France	488,330	68,751
Italy	105,700	92
Norway	23,737	1,273
Spain	112,081	5,006
Sweden	34,910	1,173
United Kingdom	661,401	81,999
Canada	446,354	57,035
Mexico	80,179	37,630
Cuba	90,534	24,921
Brazil	37,092	126,37[illegible]
Chile	126,948	23,518
China	102,511	5,303
British India	79,910	101,746
Japan	404,019	61,709
Australia	75,864	11,731
Netherlands	.....	1,286
Argentina	.....	7,172
Dutch East Indies	.....	[illegible],715
Other countries	338,613	56,157

Machine tools imported during October, 1921, were valued at $17,756.

Business Items

The board of general appraisers of the customs service has ruled that clutch driving disks are properly classified for tariff purposes under the general provision for manufacturers of metal. As such they take a duty of 20 per cent ad valorem and are not dutiable at 30 per cent ad valorem as "finished parts of automobiles," as was contended by the Collector of Customs at Detroit.

The Norton Company, manufacturer of grinding machines, of Worcester, Mass., has added four directors to its board. They are W. LaCoste Neilson, general sales manager; Henry Duckworth, controller; Louis E. Saunders, research engineer, and John C. Spence, superintendent.

The American Protective and Credit Service Corporation, 23 Union Square, New York City, will publish a monthly bulletin on the prevailing conditions in Cuba. It will be called "The Cuban Collector," and will be mailed to any of our readers on request.

Alfred Herbert, Ltd., Coventry, England, announces that after Dec. 31 its New York office will be closed. All communications should be sent direct to Coventry or to such branches or affiliated companies as the case demands. E. D. Mitchell, who has been manager of the New York office, will return to England the early part of the new year to take up duties at the home office.

The Exeter Machine Works, Inc., of West Pittston, Pa., announces the appointment of the English Tool and Supply Co. as exclusive sales agent for the Exeter rotary pump line in the Kansas City district. The English Tool and Supply Co. specializes in the marketing of tools and supplies for railways, machine shops and mills.

The foundries, machine shops and other properties in Talladega, Ala., owned by the Talladega Foundry and Machine Co., have been sold to Morris W. Bush and associates, of Birmingham, Ala. The properties consist of one small plant and one large one, the latter representing an investment of about $150,000 and regarded one of the most modern pipe plants in the South. The small plant is now in operation and the new owners expect to start the large plant in the near future.

Slater & Tuck, founders and machinists, of Beloit, Wis., have sold their plant, including five fully equipped buildings, to the American National Manufacturing Co., of St. Louis, Mo. The new owners contemplate erecting a new brass foundry in the future.

The shopmen of the Chicago & North Western Railroad, at Chicago, have agreed to accept a lay-off of one day each week and retain a full force, rather than the management's alternative of a six-day week with 90 per cent of the force. It is estimated that the wage saving by this change will be about $1,500,000.

The Sedalia Machinery and Supply Co. has opened offices in Sedalia, Mo. W. R. Large is the proprietor.

The Combustion Engineering Corporation has opened two branch offices—one at 216 Latta Arcade, Charlotte, N. C., and another at Seattle, Wash., where the Fryer-Barker Co. will be the agent.

The Rivett Lathe and Grinder Co., of Boston, Mass., has opened sales offices in the Kerr Building, Detroit, Mich. The Reed-Prentice Co. occupies the same office. The Rivett company requests that all communications for that territory be sent to the new office, as facilities have been provided for prompt attention and service.

The Crane Co., 836 South Michigan Ave., Chicago, manufacturer of steam fittings, pipes, valves, etc., has awarded a contract for a three-story addition to the present plant at West Second St., Davenport, Iowa. The Crane Co. has also acquired the plant of the Glenmore Lubricant Co., Ohio, which it will use as a distributing station after certain renovations and installations of new equipment are completed.

The Austin Machinery Corporation has established a branch factory and distributing agency at Woodstock, Ontario. It is known as Canadian Austin Machinery, Ltd.

The Exeter Machine Works, Inc., of West Pittston, Pa., announces the appointment of the Hendrie & Bolthoff Manufacturing and Supply Co., of Denver, Col., as exclusive sales agents for the Exeter rotary pump line in the Denver district. The Hendrie & Bolthoff Company specializes in the marketing of tools, pumps and supplies for railways, machine shops and mills.

Springfield, Mass., is reorganizing its Evening School of Trades after the plan of the night technical schools of Pittsburg. A three-year course in engineering has been authorized. The present one-year course will be continued. Engineers of leading manufacturing establishments in this section will serve as instructors.

The H. B. Smith Co., Westfield, Mass., has instituted night shifts in its two plants and increased its force to 1,300 to catch up with orders.

The Century Machinery Co., Holyoke, Mass., has given a mortgage of $400,000 to Jeremiah N. Hubbard and Joseph B. Weis, both of Holyoke, to secure an issue of bonds payable Nov. 1, 1931.

The Jackson Metal Products Co., of Jackson, Mich., has been taken over by the Earl Motors, Inc. It will be operated as one of the manufacturing units of the Earl company.

Personals

LAWRENCE J. STODDARD has resigned the position of sales manager of the tool division of the Greenfield Tap and Die Corporation, Greenfield, Mass., to accept a position with the Lakeside Forge Co., Lakeside, Pa.

DON M. CRAWFORD has sold his interest in the Crawford-Macbeth Co., to his partner, Mr. Macbeth. He will retire from active participation in the general foundry and machine business, but he will continue to advise the sales force of the company, which will be continued by his partner under the name of F. A. Macbeth Company.

H. F. HOEVEL has resigned as secretary and general manager of the Hoevel Manufacturing Co., Jersey City, N. J. The sale of Hoevel sand-blasts is now in charge of J. M. Batton.

F. T. COUP has been appointed district manager in charge of the Cincinnati office of the Wagner Electric Manufacturing Co., of St. Louis, Mo. Mr. Coup was formerly in charge of the Milwaukee district.

HARRY R. JONES has resigned as president of the United Alloy Steel Corporation, Canton, Ohio; EDWARD L. HANG has resigned as vice-president and secretary. Both men will continue to serve on the board of directors.

MYRON E. FORBES has been elected a vice-president of the Pierce-Arrow Motor Car Co. He is also treasurer of the company.

O. B. ILES, of the International Machine Tool Co., Indianapolis, Ind., has been appointed chairman of the committee on division of constitution and by-laws of the National Machine Tool Builders' Association, by President August Tuechter. Paul E. Thomas, of the Kempsmith Manufacturing Co., Milwaukee, Wis., and H. P. Dix, of Wilmarth & Morman Co., Grand Rapids, Mich., are the other members of the committee.

ERNEST REICH, of 11 So. LaSalle St., Chicago, Ill., is now engaged in marketing of domestic and foreign patents. Owners of meritorious inventions are invited to communicate with him with a view of selling or exchanging the manufacturing rights of American patents for foreign inventions.

ARTHUR G. HERTZLER, sales manager of the Bearings Company of America, of Lancaster, Pa., has resigned his position and will remove to his new home at Salt Lake City, Utah.

JOHN P. ILSLEY, formerly of Niles-Bement-Pond Co., New York, and later with the Reed Prentice interests, of Worcester, is now the New England manager of the selling branch of the Solvay Process Company, Syracuse, N. Y., with headquarters at 89 State St., Boston, Mass.

J. H. WILHELM, L. E. LARSON and JOHN CETRULE, consulting engineers of New York City, have been elected president, vice-president and secretary-treasurer, respectively, of the Triplex Machine Tool Corporation, which manufactures the Triplex line of combination machines. This new connection will not in any way interrupt their active practice as consulting engineers.

GEORGE CARREL, brother of J. Wallace Carrel, general manager of the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, was elected Mayor of that city, at the November election.

L. W. WALLACE, executive secretary of the Federated American Engineering Societies, addressed the Engineering Society of York, Pa., in that city on Nov. 21. He discussed the activities of the Federation.

ALEXANDER V. DYE has been appointed a trade commissioner of the Department of Commerce with headquarters at London, England. He will devote particular attention to the coal situation. He has been instructed to pay a personal visit to the British coal fields and report on his observations. Mr. Dye was formerly with the American International Corporation and has been very successful in efforts to introduce American coal mining machinery into British mines.

Condensed-Clipping Index of Equipment

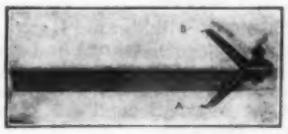
Patented Aug. 20, 1918

Center Head, Combination

Brown & Sharpe Mfg. Co., Providence, R. I.

"American Machinist," June 23, 1921.

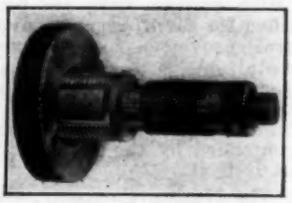
The center head furnished with the combination squares now made by the concern is ground so that both arms are of equal length, and the points *A* and *B* are equidistant from the edge of the scale. This permits the use of the center head on work of large diameter, as shown by the dotted arc.



Micrometer, Thread, Internal

John Bath & Co., Inc., Worcester, Mass.

"American Machinist," June 23, 1921.

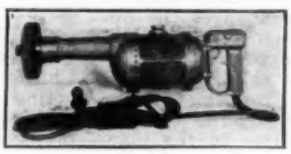


The tool is intended for the measurement of internal threads. With it, the size of a tapped hole, ring thread gage, or other internal thread may be obtained directly in units of ten-thousandths of an inch. The four measuring jaws are supported and held in alignment by closely fitting dovetail slots in the body of the micrometer, and may be adjusted for size by means of a micrometer screw and graduated sleeve. Adjustment is provided so that when wear occurs on the measuring jaws, the micrometer may be referred to the master reference ring and set correctly to size. The micrometer can be furnished with any number of threads per inch, in sizes from 1 to 5 in. in diameter.

Grinder, Portable, Electric

Black & Decker Mfg. Co., 111 S. Calvert St., Baltimore, Md.

"American Machinist," June 23, 1921.

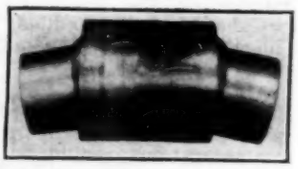


This portable electric grinder embodies the principal features of the portable electric drill made by the same concern. The grinder is equipped with a pistol grip and trigger switch, making it unnecessary for the operator to shift either hand to start or stop. While the machine is essentially a portable grinder, it is supplied complete with a quick-detachable base and adjustable toolrest, so it can be used as a bench grinder. The equipment includes two 5 x 1-in. grinding wheels, a wire brush wheel, and a rag buffing wheel. The machine is equipped for grease lubrication throughout, has forced air cooling, chrome-nickel steel gears and shafts, and aluminum alloy housing. The principal specifications are: motor, ½ hp.; speed, no load, 3,200 r.p.m.; and net weight without base, 21 lb.

Coupling, Shaft, Free-Floating, Whitney

Kay Manufacturing Co., South Norwalk, Conn.

"American Machinist," June 23, 1921.

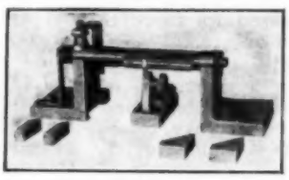


The coupling allows for both parallel and angular misalignment of the shafts being connected, as well as providing for axial movement, such as the floating of an armature. The power is transmitted from the driving to the driven hub through a floating link. A casing surrounds the parts, the hubs being prevented from slipping out by retaining rings fastened in the ends of the casing. There are no projecting flanges or pins. The hubs have square holes cast in the large ends, into which the ground ends of the semi-steel link fit. The link can thus slide in the holes and swivel in any direction, because of the rounded shape of its ends. The smallest part of it is thicker than the shafts being connected. The coupling is made in sizes to fit shafts from ⅞ to 6½ in. in diameter, although couplings having special and tapered bores can be furnished.

Attachment, Grinding, Reamer, "Common Sense"

G. L. Wood, 16 Stafford St., Worcester, Mass.

"American Machinist," June 23, 1921.

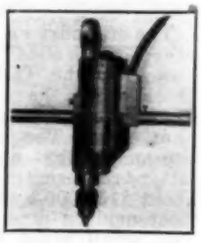


The device is adapted particularly to hand expansion reamers having pilots, but it is applicable also to the grinding of machine reamers, boring bars, pin-cutter bars and taps. Reamers from ¼ to 2 in. in diameter can be held. The reamer is expanded a sufficient amount to permit of the removal of the dull edge, and is then ground to size. It is said that the reamer can be kept to proper size throughout its entire length as long as it is expandable. The cutters of boring bars can be ground without removing them from the bars, any angle of rake or clearance up to 5 deg. being obtainable. Machine and hand taps can be reground when broken by cutting off the broken end and grinding any angle of taper and relief by the use of the tooth-rest gage.

Drill, Portable, Electric, Two-Speed

Louisville Electric Mfg. Co., 31st and Magazine Sts., Louisville, Ky.

"American Machinist," June 23, 1921.

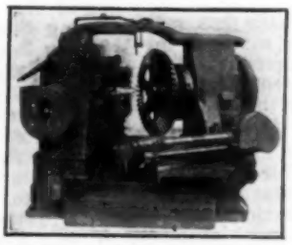


The concern has recently developed a line of portable electric tools, such as drills, grinders and motors, among which is the No. 3 two-speed Universal drill shown. The speed changes are obtained by shifting a knob located close to the handle. The switch for operating the motor is controlled by a small knob on the handle. The gears are made of heat-treated chrome-nickel steel. The frame is of aluminum throughout and is force-ventilated for cooling. Jacobs chucks are a part of the standard equipment. The drill shown has a capacity of ¼ in. on high speed and ⅜ in. on low speed. The length over all is 17½ in., and the weight 19¼ lb. A breast plate, interchangeable with the spade handle, can be furnished.

Planer, Bevel-Gear, Two-Tool, 37-Inch

Gleason Works, Rochester, N. Y.

"American Machinist," June 30, 1921.

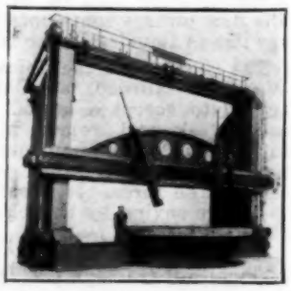


This machine is intended as a general-purpose machine for cutting large diameter and coarse-pitch bevel gears. It can cut any gears up to 26 in. cone radius, handling miter gears up to 37 in. in diameter and crown gears up to 52 in. The longest face that can be cut is 10 in., and the largest pitch 1 diametral. On the bed is mounted a pivoted work head and a stationary column carrying the tool heads. The column houses the speed-change box, crankplate drive and the slides carrying the tool heads. The distance between the tool heads is varied as the work is fed in, by means of a follower on a formed template, thus shaping the tooth. The tools reciprocate and cut alternately, working on opposite sides of the same tooth when finishing. Speed and feed changes are provided. Gages are furnished for quickly setting the tools.

Boring Mill, 35-Ft.

William Sellers & Co., Philadelphia, Pa.

"American Machinist," June 30, 1921.



This boring and turning mill is intended for machining the castings used in large hydro-electric power units. It is probably the largest machine of its type ever built, measuring 35 ft. between the uprights and 18 ft. between the table top and the tools when the crossrail is in its highest position. The bed of the machine weighs about 50 tons. The table weighs about 40 tons and is 19 ft. 10 in. in diameter and 2 ft. 3 in. thick. The cross girt carries the lifting and traverse machinery drives. The machine is driven through a 50-hp. motor, and has a speed range of 0.19 to 6 revolutions per minute. The feed range is from 1/64 to 1½ in. per revolution of the table. Each saddle is supplied with a wooden platform for an operator, where levers and push buttons give complete control of every movement.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED

Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Mass., Chicopee Falls—The Stevens-Duryea Co.—radial drills, 3 ft. and 3½ ft.

Md., Baltimore—The Continental Garage & Service Corp., 715 Gaither Bldg., J. B. Hyatt, Purch. Agt.—complete equipment for automobile repair shop, including lathe, drill presses, power hack saw, arbor press, gasoline system, tanks, etc.

N. Y., New York—J. Stolz & Son, Inc., Highbridge Station, Commerce Ave., W. J. Stolz, Purch Agt.—one electric floor grinder, 220 volt., a.c. with 2 emery wheels approximately 12 in.-14 in. diameter.

N. Y., Syracuse—H. H. Franklin Co., 302 South Geddis St.—one multiple spindle drill press, head at least 11 x 20 in., table at least 19 in. x 30 in., equipped not less 16 spindles, maximum capacity of 5/16 in.

N. J., Camden—W. J. Kelly, 675 Ferry Ave—machine tools and machinery for proposed machine shop on Haddon Ave. and Euclid St.

N. J., Camden—J. B. Moery, 284 North 34th St.—equipment for auto repair shop including lathe, drill press, etc.

N. J., Florence—The Florence Pipe, Fdry. & Machine Co.—equipment for machine shop including lathes, planers, boring machines, etc.

Pa., Philadelphia—J. K. Altemus, 2824 North 4th St., M. Altemus, Purch. Agt.—lathes, boring machines and grinders.

Pa., Philadelphia—L. F. Seyferts Sons, Inc., 437-441 North 3rd St.—
One 72 in. engine lathe, to swing at least 60 in. over carriage, 22 ft. between centers, standard modern tool, preferably motor driven.
One die sinking machine.
One Bliss drawing press, not less than 2½ in. stroke.

Pa., Pittsburgh—The Raylo Co., 1228 Fulton Bldg.—equipment for the manufacture of mechanical specialties.

Pa., Spring City—The Spring City Glass Co.—tools and machinery for proposed machine shop.

Ala., Birmingham—G. R. Mueller Co., Brown-Marx Bldg.—complete equipment for structural steel fabricating shop, including punches, shears, steam hammer, bending rolls, riveting hammers, air tools, etc. (used if in good condition). Punch, capacity not less than ¾ in. hole through ¾ in. steel plate, throat from 30 to 48 in. with architectural jaw and various shearing attachments, prefer motor driven machine for 220 volt, 3 phase, 60 cycle current. (used if in good condition).

La., New Orleans—The Louisiana Metal Cabinet Wks., 1019 Bienville St.—one late model G. A. Ohl 10 ft. 6 in. power press brake with and without die, 10 gage capacity (new or used); one late model Jones & Lamson or equal, flat turret lathe with full equipment, 2¼ in. x 26 in. (new or used); one Madison cylinder grinding machine or equal (new or used).

Va., Ashland—The Ashland Garage, England St., V. Priddy, Purch. Agt.—drill press, small lathe and shop tools.

Va., Richmond—The Auto Radiator & Fender Co., 1013 West Broad St.—metal folder and small lathe.

Va., Richmond—The Natl. Motor Co., 1629 West Broad St.—drill press and hydraulic press.

Va., Richmond—The United States Government, Richmond P. O., H. Thornton, Post Master—full line of machinery for repairing motor trucks.

W. Va., Charleston—The Nitro Mfg. Mine Supply Co., P. O. Box 1494, P. J. Rowan, Secy.-Treas.—machinery, etc., for proposed foundry and machine shop.

Ill., Chicago—E. L. Denison, 17 West Garfield Blvd.—
One Universal miller.
One power hack saw.
One boring machine.
One shaper and sticker.

Ill., Chicago—Lathrop Paulson, 2459 West 48th St.—a very large geared power press.

Ill., Chicago—The Paramount Knitting Co., 337 West Madison St.—power pipe threading machine.

Ill., Chicago—N. M. Stone Co., 2000 North Major Ave.—one die filing machine.

Ind., Michigan City—Haskell & Barker Car Co. Inc., F. O. Reemer, Purch. Agt.—
One 12 ft. gate shear, capacity ¾ in. plates.
Two single 3 gag punches, ¾ in. capacity.
One horizontal punch machine, ¾ in. capacity.
One gang punch machine, 10 ft. between housing.
One No. 9 Williams-White bull dozer.
One 750-ton capacity Bliss press.
Two 96 in. deep gap pit riveters, ¾ in. rivet capacity.
Two 48 in. shallow gap side riveters, ¾ in. rivet capacity.
One drawbar riveting machine.
Two Allen compress riveters.
Two Allen pinch bug riveters.

O., Cleveland—The Minnehaha Spring Water Co., 3658 Prospect Ave.—complete tin shop equipment (used).

Mich., Detroit—The Michigan Auto Top & Trimming Co., 123 Winder St., M. Raymond, Purch. Agt.—one 36 in. band saw, one 12 in. joiner, Universal woodworking machines and milling machines.

Mich., Escanaba—The Wolverine Delta Motor Co—medium size lathe and an air compressor.

O., Lisbon—The Wright Mfg. Co., Water St.—one 10 in. x 5 ft. lathe.

O., Minerva—The Lewis Electric Co.—48 in. or 72 in. squaring shears, 2 spot welders.

O., Toledo—The Natl. Supply Co., Clair and Washington Sts., manufacturer of mill supplies, H. E. Otis, Purch. Agt.—one 24 in. Steinle turret lathe, (used).

Wis., Appleton—The West End Auto Co., 476 South St.—equipment and machinery for auto repair shop.

Wis., Beloit—Morks Garage, P. O. Box 227—equipment for proposed auto repair shop on Main St.

Wis., Burlington—J. A. Luke—machinery and equipment for auto repair shop including press, 1 or 2 ton.

Wis., Madison—C. S. Hansen, 902 Jenifer St.—lathe, drill press and small garage tools.

Wis., Milwaukee—The Badger Auto Repair Shop, 458 14th Ave., A. L. Mutke, Purch. Agt.—one 18 in. lathe with 10 ft. bed.

Wis., Milwaukee—Jim's Repair Shop, 1524 Galena St.—one arbor press.

Wis., Milwaukee—The Mechanics Auto Co., 1914 North Ave., E. J. Sanhuber, Purch. Agt.—6 or 8 ft. lathe with 16 in. swing, standard make.

Wis., Milwaukee—The Milwaukee Shock Absorber Co., c/o H. L. Baker, 738 Wells Bldg.—machine tools and machinery for the manufacture of shock absorbers.

Wis., Milwaukee—The Milwaukee Tool & Forge Co., 220 Becher St., C. J. Lemont, Secy.—one light steam hammer.

Wis., Milwaukee—Scharf Garage Co., 516 Burleigh St., A. Scharf, Purch. Agt.—small lathe and drill press.

Wis., Milwaukee—M. Sigwart, 622 5th St. (machinist)—one bench lathe.

Wis., Prairie-du-Sac—Schmalz Bros. Co.—equipment and machinery for auto repair shop.

Wis., Milwaukee—The South Side Radiator Repair Co., 483 American Ave., A. W. Leverenz, Purch. Agt.—one hub press, 2 ton capacity.

Wis., Milwaukee—The Western Machine Co., 248 4th St., manufacturer of automatic screw machine products, W. E. Beckman, Purch. Agt.—two 4 spindle automatics of standard make.

Ia., Clayworks—Johnston Bros. Clay Wks., D. G. Johnston, Purch. Agt.—one large lathe to turn a 20 ft. or 14 ft. shaft, also to turn a pulley at least 48 in. in diameter.

Kan., Independence—The Bd. Educ.—machine shop and manual training equipment for proposed High School.

Que., Montreal—Bramsons Auto Service, Ltd., Phillip Sq., L. Bramon, Purch. Agt.—$2,000 worth equipment for new garage.

Que., Montreal—M. Miller, 976 St. Urbain St.—$250 worth tools for auto repair shop, including small lathe.

Del., Wilmington—C. Warner Co., A. D. Warner, Jr., Purch Agt.—a locomotive crane and crusher about 36 in. x 18 in., also 2 dredging pumps and centrifugal water pump.

Md., Baltimore—D. C. Elphinstone, 408 Continental Bldg.—Two electric welding machines.
One stiff-leg derrick, wood or steel, 75 ft. boom, 5-ton capacity.
One air compressor, steam driven, 100 cu. ft. 100 lb. pressure.
One air compressor, gasoline driven, portable, 100 cu.ft. 100 lb. pressure.
Three-hundred pieces sheet steel piling, 12 in. wide, 25 ft. long.

Md., Baltimore—The Maryland State Dairymen's Assn., Inc., 812 Fidelity Bldg., H. Egli, 425 Courtmand St., Engr.—complete machinery for handling milk and manufacture of milk by-products.

The Weekly Price Guide

This Week's Market

Structural shapes and soft steel bars continue to be quoted at $1.50, Pittsburgh, for large tonnages; $1.60 per 100 lb. in small lots. Plates are quoted at $1.50@$1.60 per 100 lb. No. 28 black steel sheets are quoted, at the mill, at $2.75@$3 as against $2.90@$3 and No. 28 galvanized at $3.75@$4 as compared with $3.90@$4 per 100 lb., formerly.

Increased discounts are quoted on wrought steel pipe. Electrolytic copper has advanced ¼c. and tin ½c. per lb. Slight advances are reported in copper bars and aluminum ingots; brass rods, sheets and tubing have dropped ½c. per lb. in New York warehouses. Copper sheets, wire, bars and tubing have advanced ½c. and babbitt metal ¾c.; while coke plates, bright, base size, have dropped 1c. per lb. in Cleveland warehouses.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$22.50
Northern Basic	22.02
Southern Ohio No. 2	23.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.50
BIRMINGHAM	
No. 2 Foundry	18.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	23.26
Virginia No. 2	28.74
Basic	20.75
Grey Forge	22.50
CHICAGO	
No. 2 Foundry local	21.70
No. 2 Foundry, Southern, sil 2.25@2.75	24.66
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	22.46
Basic	20.96
Bessemer	21.96

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25@2.50	3.53	3.10	3.38
No. 12	2.30@2.55	3.58	3.15	3.43
No. 14	2.35@2.60	3.63	3.20	3.48
No. 16	2.55@2.80	3.73	3.30	3.58
Black				
Nos. 17 and 21.	2.60@2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.65@2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.70@2.95	3.90	3.65	4.05
No. 28	2.75@3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	2.75@3.00	4.00	3.75	4.15
Nos. 12 and 14.	2.85@3.10	4.10	3.85	4.25
Nos. 17 and 21.	3.15@3.40	4.40	4.15	4.55
Nos. 22 and 24.	3.30@3.55	4.55	4.30	4.70
No. 26	3.45@3.70	4.70	4.55	4.85
No. 28	3.75@4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	68½	56	⅜ to 1½	44½	29½
LAP WELD					
2	61½	49	2	39½	25½
2½ to 6	65½	53	2½ to 4	42½	29½
7 to 8	62½	49	4½ to 6	42½	29½
9 to 12	62½	49	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	66½	55	1 to 1½	44½	30½
2 to 3	68½	56			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	59½	48	2	40½	27½
2½ to 4	63½	52	2½ to 4	43½	31½
4½ to 6	62½	51	4½ to 6	42½	30½
7 to 8	58½	45	7 to 8	35½	23½
9 to 12	52½	39	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	63%	49%	60½%	47½%	60%	46%
3½ to 6 in. steel lap welded	54%	40%	58½%	44½%	57%	43%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 5%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5.00	6.00	4.28
Spring steel (light) (base)	6.00	6.00	3.68
Coppered Bessemer rods (base)	8.00	8.00	6.03
Hoop steel	3.53	3.14	3.28
Cold rolled strip steel	6.25	8.25	6.75
Floor plates	4.85	2.64@2.80	5.23
Cold finished shafting or screw	3.88	3.50	3.83
Cold finished flats, squares	4.38	4.00	4.35
Structural shapes (base)	2.78	2.64	2.88
Soft steel bars (base)	2.68	2.54	2.78
Soft steel bar shapes (base)	2.68	2.54	2.78
Soft steel bands (base)	3.28	....	3.48
Tank plates (base)	2.78	2.92½	2.88
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅛	8.50		12@13
¼	7.15		11@12
1/32 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			14.25
Tin, 5-ton lots, New York			30.00
Lead (up to carlots), St. Louis, 4.60; New York			5.00
Zinc (up to carlots), St. Louis, 4.97½; New York			5.37½
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	20.00	20.00
Antimony (Chinese), ton spot	5.50	6.50	6.00
Copper sheets, base	20.75	22.00	22.50
Copper wire (carlots)	16.50	17.00	15.75
Copper bars (ton lots)	19.50	23.50	19.00
Copper tubing (100-lb. lots)	21.00	23.50	22.50
Brass sheets (100-lb. lots)	16.25	17.00	18.25
Brass tubing (100-lb. lots)	18.00	19.00	20.00
Brass rods (1,000-lb. lots)	14.25	16.00	15.25
Zinc sheets (casks), (8% dis. carlots)	11.00	10.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.50	21.00	18.00
Babbitt metal (best grade)	40.00	39.75	34.00
Babbitt metal (commercial)	14.00	13.50	8.00

—Shop Materials and Supplies

MONEL METAL—Base price in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	10.50	9.50
Copper, light, and bottoms	8.00	8.00	8.25
Lead, heavy	4.00	3.75	3.75
Lead, tea	3.00	2.75	3.00
Brass, heavy	6.50	6.00	8.00
Brass, light	5.00	4.00	5.50
No. 1 yellow brass turnings	5.25	5.00	5.25
Zinc	3.00	2.00	2.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.50	19.00	18.50
IX,	20x28, 112 sheets	23.00	21.50	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.50	16.75	17.00
IX,	20x28, 112 sheets	20.50	19.50	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	12.00	14.50
IC,	112 sheets	12.80	12.30	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.25	7.25
IC,	14x20	7.25	6.50	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.10
Wiping cloths per M., 13½x13½	.....	55.00	55.00
Wiping cloths per M., 13½x20½	.....	65.00	65.00
Sal soda, 100 lbs	2.10	3.00	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.72	.77	.76
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per ton	$3.00@3.15	
Coke, prompt foundry, Connellsville	per ton	4.00@4.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	—50%	—60%	60-10-10%
1½ and 1¼x3 in. up to 12 in.	—40%	-60-10-10%	-60-10%
With cold punched sq. nuts	—30%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	—40%	.....	$4.00 off
Button head bolts, with hex. nuts	—20%	$3.90 net	.....
Hex. head and hex. nut bolts	—20%	.....	-65-5%
Lag screws, coach screws	—50–10%	.....	—60%
Carriage bolts, all sizes up to 1 in. x 30 in.	—45%	—50-10-10%	50-5%
Bolt ends, with hot pressed nuts	—50%	.....	—55%
Tap bolts, hex. heads	—20%	.....	.....
Semi-finished nuts all sizes	—70%	—75%	—80%
Case-hardened nuts	—60%	.....	.....
Washers, cast iron, ⅜ in., per 100 lb. Off list	$5.00	$5.50	$3.50 net
Washers, cast iron, ½ in. per 100 lb. Off list	4.25	3.75	3.50 net
Washers, round plate, per 100 lb. Off list	3.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	2.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	2.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.50	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.50	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	—50-10%	60-10-10%	—65-5%
Rivets, tinned	—50-10%	60-10-10%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb (net)	$3.70	3.50	3.43
Cone heads, ditto (net)	3.80	3.60	3.53
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅞ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	—50–10%	—40-10%	—50-10%
Copper burs	—25–10%	—15%	—10%

Lard oil, pure, (50 gal. bbl.) per gal.	$0.90	$0.85	$0.90
Lard cutting oil (50 gal. bbl.) per gal.	0.60	0.50	0.55
Machine oil, lubricating, per gal.	0.45	0.35	.....
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50–5%	50–5%	50–5%
Medium grade	45%	40–10–2½%	.....
Heavy grade	40%	40%	.....
Rubber and duck:			
First grade	50–10%	50–10%	.....
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	List $9.00 less 20-10-5%	50–10–5%'-20-10%	
Emery paper	List 11.00 less 20%	$11.00 net -20%	
Emery cloth	List 32.75 less 10%	32.75 net -10%	
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll, $4.50 net		..... list+10%	
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	List $1.65 less 20%	.....	-10%
Cloth	List $3.55 less 10%	.....	-10%

Pa., Philadelphia—P. E. Flotron Co., Lafayette Bldg.—general ice manufacturing machinery for proposed plant at Pleasantville, N. J.

Pa., Philadelphia—O. Hauck & Sons, 1227 North 4th St., saws, planers and cut-off machines for proposed box factory.

Pa., Philadelphia — Ivins & Co., 627 North Broad St., H. S. Roberts, Pres.—conveying machinery, mixing machines, and electric ovens for bakery.

Pa., Philadelphia — The Rogers Hosiery Mill, Wyoming and Germantown Aves.—new shuttles, knitters, etc.

Pa., Pittsburgh—The Mackintosh Hemphill Co., 12th St., manufacturer of castings—5 ton crane.

Pa., Pittsburgh—The Natl. Tube Co., Frick Bldg., A. Boax, Ch. Engr.—5 ton and 7½ ton jib cranes.

Ala., Flomaton—The Escambia Sand & Gravel Co., C. D. S. Clarkson, Mgr.—sets of nested screens for laboratory work, sand sieves from 10 to 200 mesh, and gravel screens from ¼ to 1 in.

Ga., Atlanta—The Atlantic Ice & Coal Co., Washington St. Viaduct—machinery and equipment for proposed ice plant on Murphy and Benjamin Sts.

Miss., Gulfport—The Mississippi Cane Syrup Co., A. L. Byrd, Purch. Agt.—peanut shelling machinery, also capping and filling machinery and other equipment for use in plant with daily capacity of 3,000 gal. of syrup and molasses per day.

S. C., Badham—The Dorchester Lumber Co., manufacturers of North Carolina pine, band sawn and kiln dried—equipment for proposed mill at Garnett.

Tenn., Knoxville—The Indian Creek Land & Timber Co., P. O. Box 1094—one 18 to 24 in. 3 side planer and matcher; 24 to 30 in. cabinet planer; horizontal double spindle boring machine; vertical hollow chisel mortiser; circular resaw; self feed circular rip saw double end trim saw; cut off saw and other wood-working machinery, (used).

Va., Orange—The Pamunkey Oil & Development Co., J. M. Flaherty, Mgr.—standard drilling rig to drill up to 3,500 ft. Also interested in contract drilling.

W. Va., Huntington—Seaman Implement Co., 735 3rd Ave.—boilers (used), also woodworking machinery.

W. Va., Huntington—Mary Elizabeth Coal Co., First Natl. Bank Bldg., H. H. Morris, Pres.—will receive bids about March 1 for complete mining machinery and supplies.

Ill., Chicago—H. C. Christensen, 7258 Union Ave.—machinery for $300,000 ice plant.

Ill., Chicago—The Holbrook Mfg. Co., 2732 Cottage Grove Ave.—20 in. multiple spindle borer and one band saw.

Ill., Chicago—The Stafford Mfg. Co., 218 South Wabash Ave., furniture manufacturers, E. Stafford, Purch. Agt.—sand drum, 30, 36 or 40 in. long.

Ill., Chicago—The Garden City, Plating & Mfg. Co., 1430 South Talman Ave., A. Robertson, Purch. Agt.—surface grinder suitable for toolroom use.

Mich., Detroit—The Bd. Water Comrs., Jefferson and Randolph Aves., is receiving bids for two 3½ ton gasoline operated cranes.

Mich., Detroit—The Monarch Stamping Co., 1402 4th St.—miscellaneous equipment for making metal stampings.

Mich., Escanaba—The Pampa Land Co., D. E. Glavin, Pres.—saw and tie mill machinery.

Mich., Kalamazoo—The Kalamazoo Stationery Co.—full line of envelope making machinery for its printing plant on 7th and Everett Sts., S., Richmond, Va.

Mich., Menominee—The Menominee River Sugar Co., Wells Ave. and Pine St.—special machinery for sugar beet dumps at Sherwood, Wis.

O., Cleveland—The city, J. B. Gascoigne, 618 City Hall, Engr.—Will receive bids until Dec. 16 for a 2 ton overhead portable crane, for use on sewage treatment plant.

O., Cleveland—The Saw Sales Co., 1368 West 3rd St.—30 in. or 32 in. wood band saws (used).

O., Cleveland—The Standard Envelope Mfg. Co., 1011 Oregon Ave.—18 x 36 in. Lewis Shepherd jacklift trucks, with 6 in. wheels (used).

Wis., Fond-du-lac—The Combination Door and Screen Co., 180 Ruggles St.—wood working machinery for proposed factory.

Wis., Jump River—F. Skabroud, Jr.—cheese making machinery.

Wis., Merrill—The Heldt Fdry. Co., E. Heldt, Purch. Agt.—two brass furnaces, one cupola furnace, moulds, ladles, etc.

Wis., Milwaukee—The Caldick Furniture Co., 136 3rd St., C. Luhrsen, Purch. Agt.—one cut-off saw.

Wis., Milwaukee—The Ebony Ink Co., 82 Mason St.—special machinery for proposed factory on Villard St., North Milwaukee.

Wis., Milwaukee—The European Shoe Mfg. Co., 331 Grove St., L. Kronios, Purch. Agt.—vamping machine and eyelet machine.

Wis., Milwaukee—The Milwaukee Washing Machine Co., 155 West Water St.—one electric spot welding machine.

Wis., Milwaukee—The Milwaukee Sanitary Wiping Cloth Co., 460 4th St., M. Shapiro, Purch. Agt.—special machinery for the manufacture of wiping cloths.

Wis., Milwaukee—O. Pietsch Dye Wks., 254 West Water St.—special machinery and motors for proposed plant.

Wis., Owen—E. Z. Box Co., G. E. Anderson, Purch. Agt.—power saws and nailing machines.

Wis., Sheboygan—The Calumet Packing Co., c/o P. M. Peacock, Secy., 309 Michigan Ave.—special canning machinery for proposed plant at Dundas.

Wis., Wisconsin Rapids—The Co-operative Creamery Co., R.F.D., J. A. Rouhan, Purch. Agt.—refrigerating machinery, separators, churns, etc.; also belt driven cheese and butter making machinery.

Ark., Texarcana—The Louisiana & Arkansas Ry. Co., W. F. Wright, Purch. Agt.—set of bending rolls, 12 ft. or more between housings, 12 in. between upper rolls, (power operative), rolls to be operated through friction clutches.

Minn., Hibbing—Currie & McGraw—complete line of blacksmith shop equipment.

Ont., Acton—The Acton Tanning Co.—grinding equipment, vats, etc., for proposed leach house which was recently destroyed by fire.

Ont., Kincardine—F. B. Coombe Furniture Co.—additional wood-working machinery.

Ont., London—E. Grandier, of Teasdell Hosiery Co.—hosiery making machinery for Port Elgin plant.

Metal Working Shops

NEW ENGLAND STATES

Conn., Hartford—J. P. Nielsen & Co., 86 Maple Ave., will build a 2 story, 45 x 90 ft. addition to its garage on Maple Ave. Estimated cost, $40,000.

Conn., New Haven—J. W. Hine, Inc., 88 Commerce St., will build a 1 story, 90 x 90 ft. addition to his garage. Estimated cost, $40,000. Noted March 24.

Conn., New Haven—C. P. Judge, 581 State St., has awarded the contract for the construction of a 1 story, 80 x 130 ft. garage on State St. Estimated cost, $40,000.

Conn., Plainville—The Plainville Castings Co. has awarded the contract for the construction of a 1 story, 65 x 160 ft. addition to its casting shop.

Mass., Lowell—H. Pitts, Hurd and Warren Sts., is having plans prepared for the construction of a 2 story, 80 x 150 ft. garage on Middlesex St. Estimated cost, $125,000. Ashton, Huntres & Alter, 477 Essex St., Lawrence, Archts.

Mass., Northampton—Bd. Trustees, Smith College, will soon award the contract for the construction of a 2 story, 45 x 120 ft. garage and laundry on campus. Densmore & LeClear, 88 Broad St., Boston, Archts. and Engrs.

Mass., Springfield—D. A. Loomis, c/o Gagnier & Augers, 327 Main St., has awarded the contract for the construction of a 1 story, 70 x 145 ft. garage on Main St. Estimated cost, $40,000.

MIDDLE ATLANTIC STATES

Md., Frostburg—D. E. Gunter has awarded the contract for the construction of a 1 story service and auto repair shop. Estimated cost, $48,000.

N. J., Camden—W. J. Kelly, 675 Ferry Ave., has had plans prepared for the construction of a 2 story, 100 x 100 ft. sales and machine shop on Haddon Ave. and Euclid St. Estimated cost, $60,000. R. Draper, 436 Haddon Ave., Archt.

N. J., Camden—J. B. Moery, 284 North 34th St., is having plans prepared for the construction of a 1 story, 40 x 100 ft. garage and repair shop on 41st and Maple Sts. Estimated cost, $40,000. Lackey & Hettle, 509 Federal St., Archts.

N. J., Florence—The Florence Pipe, Fdry. & Machine Co., has awarded the contract for the construction of a 1 story, 60 x 250 ft. machine shop. Estimated cost, $75,000. Noted Mar. 31.

Pa., Philadelphia—D. D. Cassidy, 1918 North Woodstock St., has had plans prepared for the construction of a 1 story, 36 x 120 ft. garage at 1935 North Woodstock St. Estimated cost, $45,000. H. R. Stackhouse, 129 South 15th St., Archt.

Pa., Pittsburgh—The Denk Eng. Co., 45 Shannon Bldg., recently organized with $200,000 capital stock, is having plans prepared for the construction of a plant for the manufacture of mechanical products. Private plans.

Pa., Pittsburgh—The United States Lock Nut Corp., 400 Michigan Ave., Chicago, plans to construct a plant here. Estimated cost, $500,000. Architect not selected.

Pa., Pittsburgh—The Ward Baking Co., 3100 Liberty Ave., plans to construct a 1 story auto repair shop. Estimated cost, $50,000.

Pa., Spring City—The Spring City Glass Co., c/o O. Granger, will build a 1 story, 24 x 48 ft. machine shop. Estimated cost, $10,000.

SOUTHERN STATES

W. Va., Clarksburg—The United Mfg. & Equipment Co. is having plans prepared for the construction of a machine shop. Private plans.

MIDDLE WEST STATES

Ill., Hinsdale—The Stuyvesant-Peabody Coal Co. has awarded the contract for the construction of a 2 story, 120 x 208 ft. service building. Estimated cost, $250,000.

Ill., Waukegan—Wilson & Ohm, 215 South Genesee Ave., have awarded the contract for the construction of a 2 story, 50 x 130 ft. garage. Estimated cost, $45,000.

Mich., Detroit—Simons Sales Co., 436 West Willis Ave., has had plans prepared for the construction of a 1 story, 50 x 170 ft. sales and service station on Woodward and Canfield Aves. Estimated cost, $85,000. A. Kahn, 1000 Marquette Bldg., Archt.

Wis., Beloit—Morks Garage, P. O. Box 227, has awarded the contract for the construction of a 1 story, 50 x 120 ft. garage on Main St. Estimated cost, $56,000.

Wis., Milwaukee—The Conro Estate, 902 Wells Bldg., will soon award the contract for the construction of a 3 story, 80 x 114 ft. garage and loft building on Bway. Estimated cost, $150,000. R. Razall, 114 Grand Ave., Archt.

Wis., Milwaukee—O. Pietsch Dye Wks., 254 West Water St., will soon award the contract for the construction of a 1 story, 120 x 160 ft. dye works, (1st unit), on 3rd St. Estimated cost, $50,000. H. E. Birkholtz, 216 West Water St., Engr.

WEST OF THE MISSISSIPPI

Ia., Des Moines—F. Rogers, 615 Clinton St., is having plans prepared for the construction of a 3 story, 50 x 132 ft. garage. Estimated cost, $50,000. F. A. Harris, 3815 4th St., Archt.

Minn., Minneapolis—The State Bd. Control, Capitol, St. Paul, will receive bids until Dec. 2 for a 3 story metallurgical laboratory on the State University campus here. Estimated cost, $225,000. D. F. Mullen, Secy. C. H. Johnston, 715 Capitol Bank Bldg., St. Paul, Archt.

Mo., St. Louis—The Adalil Realty Co., c/o P. H. Bierman, Ry. Exch. Bldg., will soon award the contract for the construction of a 1 story, 60 x 234 ft. garage on Washington and Spring Aves. Estimated cost, $55,000. O. J. Popp, Odd Fellows Bldg., Archt. Noted Nov. 24.

Mo., St. Louis—J. Forshaw Stove & Heating Co., c/o J. Forshaw, 111 North 12th St., will soon award the contract for the construction of a 7 story, 25 x 100 ft. factory at 109 12th St. Estimated cost, $75,000. A. B. Groves, Stock Exch. Bldg., Archt. Noted Oct. 6.

Mo., St. Louis—J. G. Perculers, Jr., 603 Wainwright Bldg., is having plans prepared for the construction of a 1 story, 45 x 150 ft. garage and machine shop at 5152 Southwest Ave. Estimated cost, $45,000. Private plans. E. J. Sudhoff, 2648 California Ave., lessee.